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# **Hospital Car Parking: The Impact of Access Costs**

**CHE Research Paper 59**



# **Hospital Car Parking: The Impact of Access Costs**

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## Executive Summary

### Background

NHS Trusts have statutory powers to raise income, which allow them to decide whether to charge, and how much to charge, for hospital car parking. Trusts are not obliged to provide parking facilities on their premises, but provision will inevitably incur costs in the form of maintenance, security and staffing. If Trusts choose not to charge for parking, then these costs must be covered from other sources of revenue, potentially diverting resources from patient care. Charges typically account for around 0.25% of a hospital's income, but can be as high as 1%. The government offers financial support to people on low incomes who incur travel expenses when accessing health care.

### Objectives and methods

Two rapid literature reviews were undertaken inform government policy on hospital car parking charges. The first review (Part 1) included studies that quantified access costs and / or considered their impact on patients and on visitors. The second review (Part 2) considered access costs more broadly in terms of travel time or distance, and focused on UK evidence on the impact of these costs on the utilisation of secondary care services.

### Results

#### ***The full economic cost of access to healthcare services for patients, in both time and money***

Between 70 and 90% of patients who accessed hospitals used cars to attend for outpatient appointments. Travel costs (including parking charges) for a course of treatment ranged from about £60 to £400. Parking charges were often not reported separately from total travel costs, but limited evidence suggested that they were highly variable. Parking experience tended to affect patient satisfaction only when the experience was either very good or very bad. Difficulties with parking – time spent queuing for a space, finding the correct change – were commonly cited as stressful and negative events for patients. Estimates of time costs used different methodologies and were difficult to compare. However, 4 to 5 hours was often cited as the time needed to attend for an outpatient appointment.

#### ***The distribution of these costs across different users***

Individuals attending regularly for courses of treatment – for example, cancer patients, physiotherapy patients, people with renal failure, people with mental illness – incurred the highest travel costs. Self-evidently, patients and visitors living furthest from the healthcare setting also incurred higher travel and time costs than local residents. For patients with chronic conditions that affected their ability to work, their reduced income amplified the financial burden of access costs. Chronic illness could further impact household budgets through increased heating bills and related expenditures.

#### ***The impact of costs on utilisation for different groups***

Part 1 identified no evidence on the relationship between monetary access costs and patient uptake of hospital services. Part 2 found evidence on the relationship between access costs, proxied by distance or travel time, and utilisation. This evidence came mostly from observational studies that adjusted for potential confounders such as deprivation. Access costs significantly lowered the rate of utilisation for emergency services, elective care, outpatient attendances, and non-specialist inpatient services. However, access cost had little or no effect on uptake of screening. Evidence on specialist services was mixed, but access to cancer centres appeared to be an important determinant of survival and greater distance from hospital was associated with an increased likelihood of diagnosis at death.

#### ***The proportion of inpatients who have adequate numbers of visitors during their stay***

The literature review did not identify any systematic and comparable evidence on the proportion of inpatients satisfied with current visitor numbers. There was limited evidence for some patient groups. Psychiatric inpatients received fewer visits on average than medical inpatients, were more likely to receive no visits, and were less likely to receive gifts, flowers and cards. These negative effects were more pronounced in long stay psychiatric patients. Studies found that around 25% of critical care patients received no visits. These were usually older patients with shorter stays and who lived alone. Critically ill patients with advanced dementia, and ethnic minority patients, had significantly less family visitor time, and US studies found that African Americans were more likely than other ethnic groups to

die without a family member being present. Compared with short-stay patients, older people receiving long term care typically received fewer visits, and a higher proportion received no visits.

### ***The role of access costs in determining visitor numbers***

Visitor access costs increased with travel distance, and visitors of inpatients with chronic conditions often incurred loss of income, had higher out-of-pocket expenditures (for example, for child care) and incurred financial and non-monetary costs for parking. Several studies from outside the UK identified an inverse relationship between travel distance and visiting frequency for parents of critically ill babies. One UK study from the 1970s found that greater distances between home and hospital resulted in little reduction in the frequency of visiting of either short-stay (less than six months) geriatric patients, or short and long-stay psychiatric patients, but resulted in less frequent visiting of long-stay geriatric patients.

### ***The impact of visits upon health and wellbeing of inpatients and upon their families***

Visits for inpatients benefited patients through providing and interpreting information, and by providing reassurance, comfort, calm or support (sometimes from unrelated visitors). One study assessed quality of life, and found that the frequency of family visits was the strongest functional quality-of-life predictor for short-stay psychiatric patients. Most studies found no evidence that visitor numbers, or visitor frequency, affected length of stay or readmissions rates. However, a study of terminal illness found that family presence at death was associated with reduced use of life-supporting technology and increased use of 'comfort care' (such as pain relief and sedation). Another study found tentative evidence that lower rates of maternal visits for preterm infants were associated with poorer behavioural development of the child in later life. Preventing children from visiting very sick parents appeared to be linked with short- and long-term adverse effects for the child. Visitors of patients with chronic conditions often reported a 'changed rhythm of life', changed family roles and an adverse impact on leisure time. Negative effects of visitors on inpatients included guilt, worry, worsened pain, stress from one's own and others' visitors, embarrassment at receiving treatment in front of visitors, tiredness, and discomfort at visitors being present at mealtimes.

## **Conclusions**

Recent improvements in study methodology, computational capacity and data availability mean that there is now a growing body of evidence that higher access cost, as proxied by distance or travel time, is negatively related to utilisation for some services. The majority of patients attending for outpatient appointments use cars to access the hospital. In England, parking charges vary geographically and the parking experience can be an additional source of financial pressure, worry and stress. Parking charges are an important source of income for hospitals (typically around 0.25% of income) and the opportunity cost of dropping charges is a reduction in resources available for patient care. However, the stress caused by hospital parking is largely avoidable. Hospitals should be encouraged to make the parking experience as unstressful as possible for patients and visitors by, for example, providing clear and easily accessible information on parking charges and policy, sources of financial support and the availability of permits or season tickets for regular users.



## Part 1: Evidence review to inform policy on charging

### Introduction

#### Policy background

NHS Trusts have statutory powers to raise income ('Income generation powers'),<sup>1</sup> which allow them to decide whether to charge, and how much to charge, for hospital car parking. Trusts are not obliged to provide parking facilities on their premises, but provision will inevitably incur costs in the form of maintenance, security and staffing. If Trusts choose not to charge for parking, then these costs must be covered from other sources of revenue, potentially diverting resources from patient care.<sup>2</sup> Moreover, if the supply of parking space is less than demand, either because of patient or visitor car use or if non-hospital users can access the car park (e.g. in a city centre), then parking charges may be the fairest method of rationing spaces. Trusts must consider the needs of all bona fide users, including hospital clinical and administrative staff, patients, visitors and emergency vehicles (ibid).

Patients with a clear (authorised) medical need can use the non-emergency Patient Transport Service, and those on low incomes are eligible for financial support from the Hospital Travel Costs Scheme (HTCS).<sup>3</sup>

#### English hospital car parking charges

Given the level of discretion accorded to Trusts in determining the level of parking charges, it is unsurprising that these vary widely between hospitals. Evidence on this has been collected by bodies representing several patient groups: older people (Age Concern<sup>2</sup>), cancer patients (Macmillan Cancer Research<sup>4</sup>), families of disabled children (Contact a Family<sup>2</sup>), people with chronic conditions (e.g. Cystic Fibrosis Trust, Diabetes UK, MIND<sup>2</sup>) and people on low incomes (Citizen's Advice Bureau<sup>2</sup>). Macmillan estimated that hourly parking charges averaged £1.22 (range: £0.30 to £4; 2003/4 prices) and that cancer patients often suffer reduced income as a direct result of their condition, with total charges being higher the greater the treatment need. The charity 'Contact a Family' reported independent findings that 10% of 67 hospitals surveyed offered free car parking and fewer than 4 in 10 offered parking concessions. The average charge for a 24 hour stay was £8.50 and the maximum was £55.20.

Age Concern highlighted additional issues, such as the failure of appointment letters to provide information on parking charges, inadequate numbers of disabled spaces, unpredictable and sometimes excessive waiting times within the clinic causing patients and/or their escorts to incur unnecessary parking costs and the potential for charges to deter inpatient visitors. Similar dissatisfaction was expressed by other stakeholder groups, with concern that charges hit the poorest and sickest hardest: patients who require long courses of treatment or those on low incomes. Public transport and hospital transport are often neither adequate nor suitable for immune-compromised patients (such as cancer patients).<sup>4</sup> The adverse impact on visiting levels, which can particularly affect the recovery of those suffering mental illness, was also raised as a concern.<sup>2</sup>

#### The House of Commons Health Select Committee Report on NHS Charges

The Health Committee's report (2006)<sup>3</sup> found that English hospitals provided around 400,000 parking spaces and raised £15m in parking charges from staff plus around £68m from visitors. These figures related to 2004/5 and were based on a survey of NHS trusts (response rate: 80%). The Committee estimated that parking charges accounted for typically less than 0.25% of a hospital's income, although the figure was as high as 1% for some hospitals.

The Committee recommended that hospitals provide reduced parking rates for patients and their visitors who attend hospital regularly (perhaps with a 'season ticket'), and free parking for those who must attend daily. The committee noted that numbers falling into the latter category had increased over recent years, largely as a result of policies to reduce inpatient stays. It also recommended a cap on weekly parking charges for patients and that full information on charges and exemptions should be provided before the start of treatment.<sup>3</sup>

The Department of Health welcomed the Committee's recommendations on parking. The Department clarified that it had previously issued specific guidance for NHS bodies on car parking charging schemes. This guidance mirrored many of the concerns raised by the committee, recommended that

free or subsidised passes be available for the patient groups named by the Committee. The Department stated its commitment to support the Committee's recommendations in future guidance on income generation schemes.

## **The Healthcare Travel Costs Scheme**

First established in 1988, the Hospital Travel Costs Scheme (HTCS) provided financial assistance to patients who do not have a medical need for patient transport services, but who require assistance in meeting the cost of travel to and from their care.<sup>5</sup> The 2006 White Paper, 'Our Health, Our Care, Our Say', set out the government's strategic objective of achieving a "shift in the centre of gravity of spending", moving resources away from hospital settings and towards prevention and health promotion. The White Paper included a government commitment to extend the travel costs scheme to cover referrals for treatment in primary care settings.<sup>6</sup> In April 2009, the scheme was renamed the *Healthcare* Travel Costs Scheme and extended to cover NHS care referred by any healthcare professional, not just care under a hospital consultant. Patients must use the "cheapest and most appropriate means of transport" and those using cars will be reimbursed for fuel, "unavoidable" parking charges and toll charges. In addition, travel payments for an escort, when medically necessary, are available; the scheme also covers foreign travel costs for NHS care arranged abroad.<sup>7</sup> As the PbR tariff no longer includes HTCS, PCTs reimburse providers directly for payments made under the scheme for all patients resident within their local areas.

## **Objectives**

The aim of this scoping study was to identify evidence that addressed the following questions:

- 1a. the full economic cost of access to healthcare services for patients, in both time and money (direct and opportunity costs, including explicitly car-parking costs)
- 1b. the distribution of these costs across different users
- 1c. the impact of costs on utilisation for different groups
- 2a. the proportion of inpatients (according to their lengths of stay, and other criteria that may determine the importance of receiving visitors) who have adequate numbers of visitors during their stay
- 2b. the role of access costs in determining visitor numbers
- 2c. the impact of visits upon health and wellbeing of inpatients (including both experienced quality of care and care outcomes) and upon their families.

## **Methods**

A scoping review of the literature was undertaken. Search strategies were designed to identify (1) 'Car Parking': the cost of accessing healthcare services (including parking charges) and (2) 'Visitors': studies on those visiting inpatients, including the impact of access costs and positive and negative effects of visiting. Searches were limited to papers published in English (see Appendix for strategy details). Databases searched included Medline, Embase, HMIC, Econlit, PsycInfo, NHS Economic Evaluation Database and Index to Theses. Google Scholar was also searched to identify relevant economic evaluations that had including parking costs, because this approach allows the full text of articles to be searched (rather than just the titles, abstracts and key words that are searched in electronic databases).

Hits were screened for relevance and articles retrieved electronically. The timescale for the study did not allow for paper copies of articles that were unavailable online to be ordered through the interlibrary loan system.

## **Results**

The first search, 'Car Parking', identified 238 records (341 before deduplication). The second search, 'Visitors' identified 293 records (416 before deduplication). Twenty-eight further articles were identified from Google Scholar or from hand searches.

For the review of car parking, 48 potentially relevant studies were identified. Of these, 37 were available and details of the data extraction are in Appendix 2 (Table 1). Eleven potentially relevant

studies were not available electronically and so could not be retrieved within the review timeframe. These studies are listed in Appendix 3.

The review of evidence on visitors identified 49 potentially relevant references. Twenty of these were unavailable online and are listed in Appendix 3. The remaining 29 references were reviewed and details of the data extraction are in Appendix 2 (Table 2).

### The economic cost of access to healthcare services for patients

The review identified 58 potentially relevant studies. Of these, 37 provided quantitative or qualitative data on the cost to patients of accessing healthcare services (including parking costs). Almost half (43%) of the studies were based in the UK (Figure 1).

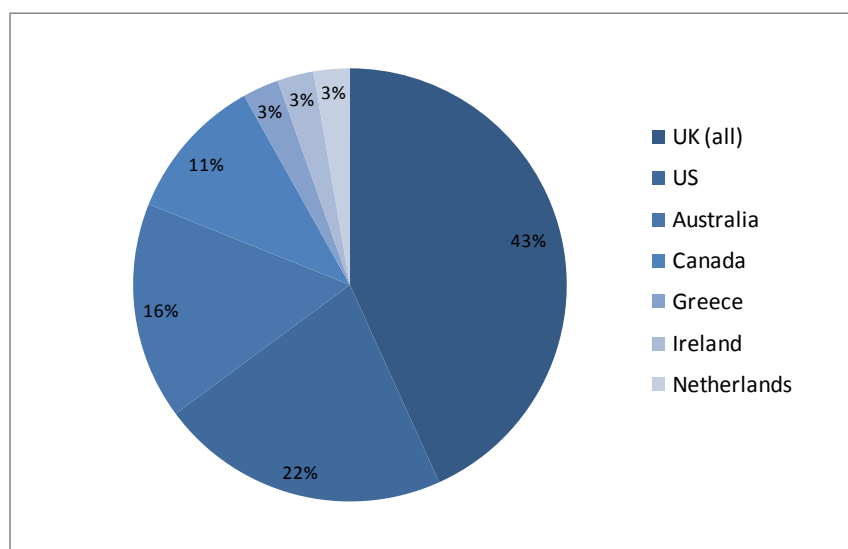


Figure 1: Country setting for included studies (car parking) (N=37)

The disease areas covered by the studies are summarised in Figure 2. Ten studies (27%) were of cancer patients, 7 (19%) were not specific to any particular disease, 4 (11%) were of cardiovascular disease. Five studies focused on paediatric patients.

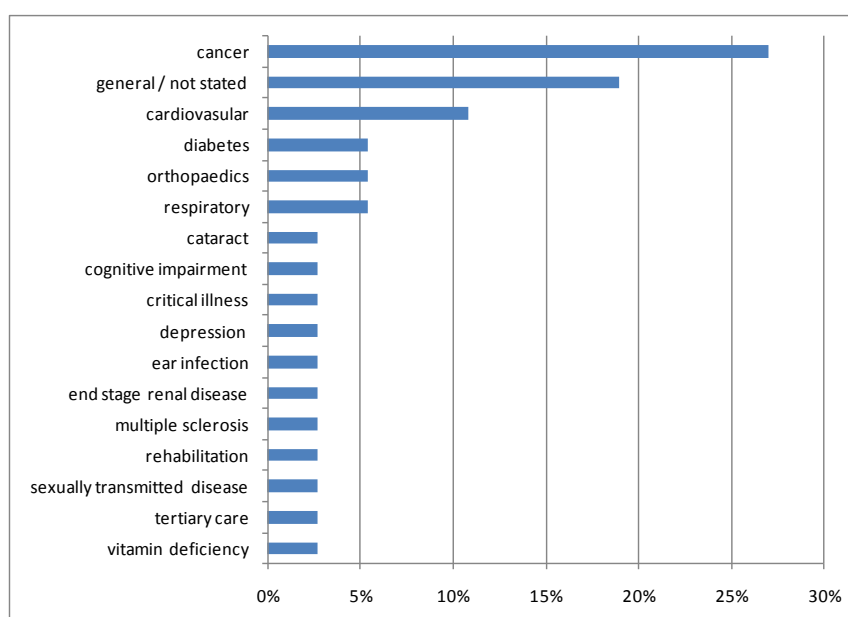


Figure 2: Disease areas covered by included studies (car parking) (N=37)

## 1a. The full economic cost of access to healthcare services for patients, in both time and money (direct and opportunity costs, including explicitly car-parking costs)

### *Full economic cost (including indirect costs)*

Five UK studies reported estimates of the full cost incurred by patients for accessing health care services.<sup>8-12</sup> Price dates ranged from 1997/8 to 2003/4. Estimates for the cost of a single visit ranged from around £7 (for attending a GP clinic to receive results for Chlamydia screening)<sup>10</sup> to around £20-30.<sup>8, 11</sup> In these studies, total access costs for an episode of illness ranged from £50 (diabetes)<sup>9</sup> to over £80 (critical care).<sup>12</sup> Evidence from outside the UK broadly supported these findings. Estimated access costs from a US study of screening and diagnostic clinics for cervical cancer ranged from US\$50 to \$120, reflecting differences in visit duration and travel distance.<sup>13</sup> Patient costs for attending diabetes clinics were similar (mean: US\$59 (range: 10–505)).<sup>14</sup> An Australian study found that access costs incurred by parents visiting their children in hospital averaged AUS\$200/week.<sup>15</sup> A Dutch study of psychotherapy for patients at high risk of depression estimated that annual access costs were between €450 and €500, with patient time valued at an extra €2,200 to €3,200.<sup>16</sup>

### *Travel costs*

Travel costs were reported by 9 UK studies. The percentage of patients using cars to travel to healthcare facilities was high, typically 70%-90%, although some studies did not report this statistic. Costs for a single outpatient visit were in the region of £6 (colorectal cancer screening<sup>8</sup> and cataract surgery<sup>17</sup>). Travel costs for attending a GP surgery were around £1.50.<sup>10, 9</sup> Mean travel costs for an episode of care ranged from £60 (outpatient clinic for multiple sclerosis)<sup>18</sup> to £380 (for a course of cancer treatment).<sup>4</sup> Unsurprisingly, there was a great deal of variation within studies: for example, one study found that travel costs ranged from £2 to £100,<sup>12</sup> and another study reported travel distance varying from 0.5 to 60 miles.<sup>18</sup> Evidence from other countries is not directly comparable with UK study findings because the cost of motoring may be substantially lower (e.g. price/mile in US studies was \$0.31, and in Canada was \$0.43, whereas the estimate used in UK studies was £0.60). However, overseas studies also reported wide variations in travel costs: for example, a Canadian study of cancer patients' monthly out-of-pocket expenses found that travel costs averaged CAN\$370, but the cost for individual patients ranged from \$0 to \$6,180.<sup>19</sup>

### *Parking costs*

Although all the studies assessed parking costs (either quantifying these or by soliciting user views), findings on parking costs were rarely reported separately. In some studies, the majority of patients were escorted to the hospital and the escort paid the parking charge (and studies did not assess escorts' views). Amongst the UK studies, only two reported parking costs<sup>4, 12</sup> but eight studies reported user views on parking.<sup>4, 12, 20-25</sup> The Macmillan study found that parking charges averaged £1.22/hr but this ranged from £0.30 to £4/hr (2003/4 prices).<sup>4</sup> The study by Thalaney reported parking charges at the lower end of this range (£1.05 for 4 hours; 2001/2 prices).<sup>12</sup> There was tentative evidence from the US that free parking passes could increase patients' outpatient attendance rates.<sup>26</sup>

Parking also imposed non-monetary costs, in terms of time and stress. Haynes (2006) found that cancer patients needed an average of 7.4 minutes to park, but one third of respondents took over ten minutes and a small number of users reportedly took over half an hour to find a parking space.<sup>23</sup> This study noted that "the difficulty in finding a parking space at the hospital was the most frequent negative comment made by respondents", a finding supported by a separate study of cancer patients.<sup>24</sup> Whynes (1996) explored GPs' views on factors affecting their referral decisions, and found that the doctors' assessment of patient convenience was mainly driven by the quality of parking facilities and the availability of public transport.

Interestingly, an Australian study found that parking had a significant effect on patient or visitor satisfaction only when the parking experience was either very good or very bad.<sup>28</sup> This could be one reason why patient satisfaction with parking appears to vary by site,<sup>29, 30, 20</sup> if parking experience is satisfactory then it seems to have little or no impact on overall satisfaction with the hospital. Other studies confirm that parking is, unsurprisingly, less important than quality and process of care in determining patient satisfaction with hospital services.<sup>28, 31, 32</sup>

### *Time costs*

Six UK studies assessed the length of time patients spent at the hospital and/or whether working time was lost. The proportion of patients who take time off work varies by condition: for example, a study of Chlamydia screening found that almost 60% of attendees would have been at work,<sup>10</sup> whereas the

proportion for patients attending for colorectal screening was much lower (25%).<sup>8</sup> A US study of diabetes in adolescents found that attendance at outpatient clinics resulted in approximately 0.4 of a day off school, whereas the time cost for their parents was slightly higher (0.5 day).<sup>14</sup> The finding that a 2-3 hour outpatient appointment typically 'cost' patients around half a day (4 to 5 hours) of their time was supported by several other studies.<sup>13 17</sup>

### 1b. the distribution of these costs across different users

The groups most affected by access costs are those attending regularly for the treatment of chronic conditions, such as cancer patients,<sup>4 19</sup> people with end-stage renal disease undergoing haemodialysis,<sup>30</sup> people attending for physiotherapy<sup>33 34</sup> and those with mental illness.<sup>16</sup> Families of paediatric inpatients are also likely to incur substantial access costs.<sup>15 35</sup> This list is not exhaustive and reflects the nature of the evidence base: an 'absence of evidence' for a particular disease area does not imply an 'evidence of absence', i.e. does not demonstrate that access cost is unimportant for that patient group. However, the non-monetary costs of parking (inconvenience, time taken and uncertainty regarding parking charges and/or limited availability of spaces) may be greater for those who use services on a non-regular basis, or for first-time users with chronic conditions. If the patient has a chronic condition that affects ability to work, then the illness itself may exacerbate the impact of access costs (i.e. the costs represent a higher proportion of income, since the latter is reduced through illness). The illness may also affect other areas of expenditure, such as increased fuel bills for heating,<sup>37</sup> putting further pressure on reduced household finances.

For those attending care at GP clinics or for one-off outpatient visits, access costs are lower, and can be influential in determining choice of treatment setting: i.e., patients prefer care in an environment where they will incur lower out-of-pocket expenses.<sup>36</sup>

### 1c. the impact of costs on utilisation for different groups

The review identified no evidence exploring the relationship between monetary access costs and uptake of hospital services by patients.

### Review of evidence on visitors

The heterogeneous nature of visitors makes it methodologically difficult to provide clear cut answers to the review questions. A visitor is not simply a person who visits a hospital patient: a visit from a close relative is not the same as a visit from an adult child, or a neighbour or a friendly stranger (the latter model was used in some studies). Moreover, a visit from a particular individual may have a different effect on the same patient depending on how tired or ill the latter is feeling, and on the duration and timing of the visit. Therefore, the effects of a visit by type, duration and timing cannot be evaluated in the same way that one can evaluate the type, treatment duration and dosage of a drug. The following sections should be read with this caveat in mind.

The review identified 48 potentially relevant studies. Of these, 29 provided quantitative or qualitative information relevant to the study questions. Most of the studies were based in the UK (31%) or the US (31%) (Figure 3).

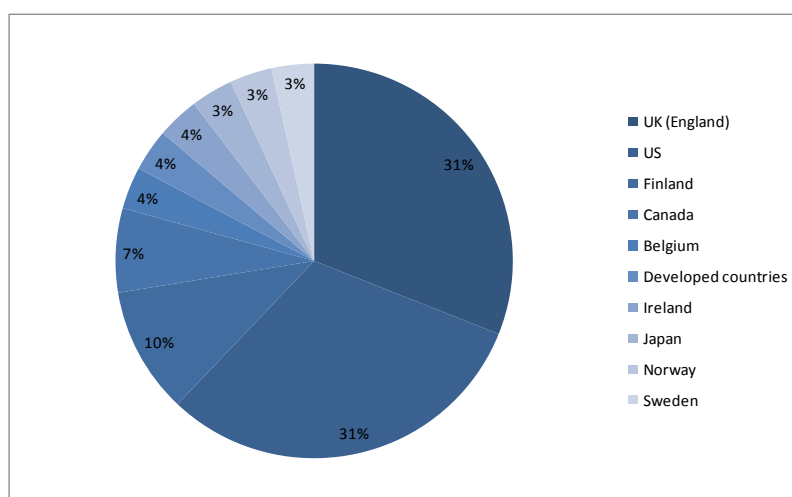


Figure 3: Country setting for included studies (visitors) (N=29)

Figure 4 shows the types of condition or disease areas covered by the included studies. These areas were quite different from those in the car parking review. Evidence on visitor effects comes mainly from studies of paediatric inpatients (covering newborns (preterm and those with critical illness) and children), people with mental health problems and critical illness in adults. Together, these groups accounted for 66% of the studies in this part of the review. Critical illness is not, of course, a disease area. However, studies rarely reported the conditions affecting patients in critical care units and none of the studies reported findings separately by patient group.

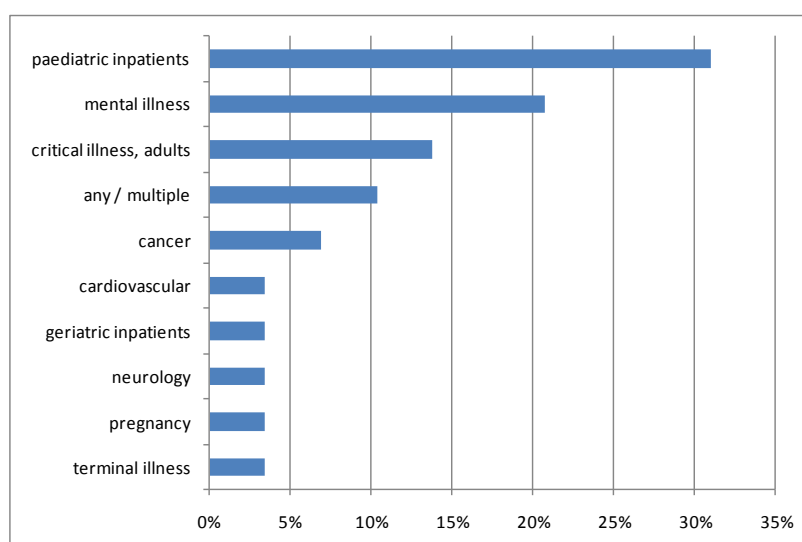


Figure 4: disease areas covered by the included studies (visitors) (N=29)

## 2a. the proportion of inpatients (according to their lengths of stay, and other criteria that may determine the importance of receiving visitors) who have adequate numbers of visitors during their stay

The literature we identified in this review did not address these questions directly: we found no systematic and comparable evidence on the proportion of inpatients satisfied with current visitor numbers. Several studies asked patients and /or visitors for their views on how long visitors should stay, the maximum number of visitors that should be allowed at any one time and whether opening or restricted hours are preferred.<sup>38-42</sup> These studies did not establish whether patient or visitor preferences were met, nor did studies ask about optimal or adequate visitor numbers over an inpatient stay.

### *Visitors for psychiatric patients*

However, there was some evidence of 'suboptimal' visitor numbers for three patient groups: psychiatric inpatients; those with critical illness; and geriatric patients. Three of the 5 studies of psychiatric patients were based in the UK. A study from the mid 1970s reported that almost 40% of psychiatric inpatients received no visitors<sup>43</sup> and a study undertaken 20 years later found that psychiatric inpatients received significantly fewer visits, gifts and cards compared with medical inpatients.<sup>44</sup> Another UK study from the 1970s assessed visiting rates during one week for 480 patients in a rural psychiatric unit. The study found that 33% of short-stay patients received no visits, but the proportion of long-stay patients unvisited during the week was much higher (74%).<sup>45</sup> On average, both short stay and long stay patients who were visited received 1.7 visits /week. Evidence from other countries broadly supported these findings. A Japanese study of patients with schizophrenia found that long-stay patients were significantly more likely than those with intermittent stays to have no or fewer visits.<sup>46</sup> An American study reported mixed findings: adolescent psychiatric inpatients were more likely than other age groups to be adversely affected by a lack of visitors, whereas elderly patients often found visits unsettling.<sup>47</sup>

### *Visitors for critical care patients*

There was also some evidence on the adequacy of visitor numbers for people with critical illness. A small Norwegian study of 11 critical care patients found that, at the earlier stages of the patients' ICU stage, they were often unable to communicate. These patients preferred visits only from next of kin and preferred limited contact time; some wanted visitors to be present without communicating. Two of

the 11 patients interviewed were indifferent to visitors; however, none of the study participants expressed a wish not to be visited at all.<sup>48</sup> Evidence from Sweden found that 25% of critical care patients had no visitors. These patients tended to be older, have a shorter ICU stay and more often lived alone.<sup>49</sup> Evidence from the US found that critically ill patients with advanced dementia and ethnic minority patients had significantly lower family visitor time than other inpatients with critical illness.<sup>50</sup> A study of terminal illness supported this finding: African-American patients were least likely of all ethnic groups to have a family member present at death.<sup>51</sup>

### ***Visitors for geriatric patients***

One UK study from the 1970s assessed visiting rates for 470 geriatric patients. The study measured visiting rates over one week and found that just 4% of short-stay (less than six months) patients received no visits, but the proportion of long-stay patients unvisited during the week was higher (25%). Short stay patients received 7.7 visits per week on average, whereas longer stay patients who were visited at all received about half this number (3.3). Patient satisfaction with visitor numbers was not assessed.

## **2b. the role of access costs in determining visitor numbers**

Findings from the review of patient access costs (section 1a) were echoed in this literature. Visitor access costs increased with travel distance, visitors often incurred loss of income, had higher out-of-pocket expenditures (for example, for child care) and incurred financial and non-monetary costs for car parking.<sup>52-56</sup> For example, Thalaney (2006) investigated parking costs for people visiting critically ill relatives in the UK and found that, although charges were low, they nevertheless caused stress and concern:

“While some daily visitors were worried about the costs involved (£1.05 for 4 hrs) others felt that finding the right change was a problem and a cause of additional stress to them. Some felt that it was unfair to charge relatives visiting severely ill patients. One pensioner mentioned that since her husband’s hospital admission she had spent more than £100 in parking charges alone.” (p46)<sup>12</sup>

There was more limited evidence on the impact of access costs on visiting levels. Several studies addressed the impact for parents visiting infants in critical care and one study from the 1970s looked at the effect on visits for two groups, geriatric patients and psychiatric patients.

### ***Visitors for critical care infants***

The clearest evidence on the impact of access costs on visiting levels was for parents visiting critically ill newborn children, although none of these studies was set in the UK. A Belgium study of 61 parents of hospitalised preterm infants found that travel distance was highly variable (range: 1 to 130 km) and that inpatient stay also varied widely (5 to 140 days). The weekly visit rate dropped significantly with increasing distance, and although the rates of telephone calls increased with increasing distance, this trend was not statistically significant.<sup>57</sup> A Finnish study reported similar findings, with visits being less frequent the longer the distance between home and hospital. This effect applied to visits from both mothers and fathers. Fathers also visited less frequently if the infant had siblings.<sup>58</sup> Evidence from the US confirmed that distance affected visit rates. Giacoia and colleagues (1985) compared visit rates for two groups of preterm infants treated in a single hospital: the first group were those born within the locality and the second group had been transferred from outside the region (‘outborn’ group).<sup>53</sup> The authors found a decline in visit rate for intensive care infants when distance exceeded 50 miles: “frequency of visits was correlated to social class. The most commonly identified factors limiting visiting were care of siblings, demands of work, cost of the trip, and distance.” Both the mean travel distance and access cost per visit incurred by parents were significantly higher in the ‘outborn’ group. Although the outborn group paid their children significantly fewer weekly visits (3.6 vs. 6.6), the total mean access cost incurred during their infant’s hospitalisation was substantially higher (US\$328 vs. \$135).

Although none of the UK studies examined the impact of travel distance on visit rates, UK studies identified similar variation in travel distances and travel costs. For example, Smith and colleagues (1983) adopted a similar design to the US study by Giacoia, comparing travel distances and costs for parents of ‘inborn’ and ‘outborn’ preterm infants in a special care baby unit in the UK.<sup>56</sup> In this study, parents’ travel time for a round trip to the hospital ranged from 10 minutes to six hours, with distance varying from under one mile to 266 miles. There is no reason to expect that differences of this magnitude would have no effect on visiting rates.

### ***Visitors for geriatric patients and psychiatric patients***

One UK study from the 1970s looked at the impact of travel distance on visiting rates for short and long-stay patients in geriatric units (470 patients) and in psychiatric units (480 patients).<sup>45</sup> Whereas greater distances between home and hospital (up to 20 miles) resulted in little reduction in the frequency of visiting of short-stay (less than six months) geriatric patients and of both short and long-stay psychiatric patients, they resulted in much less frequent visiting of long-stay geriatric patients.

## **2c. the impact of visits upon health and wellbeing of inpatients (including both experienced quality of care and care outcomes) and upon their families.**

A study of cancer patients and their visitors drew conclusions that apply more widely to this body of literature:<sup>59</sup>

Informal, often supportive, interaction between patients and fellow patients, and their carers/visitors, takes place in the wards, departments and outpatient facilities of cancer hospitals on a daily basis but this has remained largely invisible and unanalysed.

Assessment of visitor effects is uncommon and non-systematic. The review identified 21 studies that assessed the impact of visits on patients and/or their visitors, but there was insufficient uniformity amongst the assessment methods to allow any formal pooling of results. The key messages emerging from the literature are summarised below.

### ***Impact of visits on health and wellbeing of inpatients***

One positive effect of visits for inpatients was to help provide and interpret information, facilitating a two-way communication between inpatients and staff.<sup>38 39 60</sup> Some groups of patients, such as those from ethnic minorities whose first language is not English<sup>60</sup> or critical care patients<sup>38 39</sup>, may have significant problems communicating with staff. Visitors were able to interpret patient wishes to staff, and explain about treatments and procedures to patients. A second, and related, beneficial effect was the ability of visitors to provide reassurance, comfort, calm or support.<sup>38 39 48 51 59</sup> There was also evidence of supportive interaction between patients and those visiting other inpatients: a study of inpatients at a regional oncology centre in the UK found that “visitors recognised negative emotions such as worry, fear and low mood in other patients/visitors and were often prepared to address them.”<sup>59</sup> One study assessed quality of life: this US study found that the frequency of family visits was the strongest functional quality-of-life predictor for psychiatric patients experiencing an acute exacerbation of their condition.<sup>61</sup> This study also reported significant positive impacts on length of stay and readmissions, but found no impact on mental health outcomes. A Japanese study also found an association between length of stay and visitor frequency.<sup>46</sup> However, the few studies that assessed similar outcomes did not generally support this finding. A Swedish study of critical care patients found no relationship between visit rates and length of stay or mortality.<sup>49</sup> Findings on the longer-term effects of visiting for preterm infants were mixed: a US study of critically ill newborns found that visit frequency had no detectable emotional impact on infants when children were reassessed at 18 months,<sup>62</sup> but a Finnish study with a longer follow up (6-7 years) did identify a significant relationship between the number maternal (but not paternal) visits and children’s later behavioural problems.<sup>63</sup> A Canadian study of foster grandparent visitors to paediatric inpatients who were ‘undervisited’ found no positive effects on children’s mood relative to the control group.<sup>64</sup> An American study of family presence at death for patients with terminal illness also found no statistically significant effect on length of stay, but identified positive effects of visitors on patient care. Tschann and colleagues detected an association between family presence and reduced use of life-supporting technology and increased use of comfort care (such as pain relief and sedation) at the end of life.<sup>51</sup> Positive effects of visitors on patient care were also reported by the study of Cardiac Intensive Care Units in the US.<sup>38</sup>

Negative effects of visitors on inpatients included guilt<sup>65</sup> worry,<sup>38 39</sup> worsened pain,<sup>38</sup> stress from one’s own<sup>47 48</sup> and others’ visitors<sup>66</sup>, embarrassment at receiving treatment in front of visitors,<sup>42</sup> tiredness,<sup>41 42</sup> and discomfort at visitors being present at mealtimes.<sup>41 42</sup> One questionnaire study conducted at a regional oncology centre in the UK found that patients, visitors and staff agreed almost unanimously that visitors should be better educated on infection control.<sup>41</sup>

When interpreting evidence of associations between visitor numbers and length of stay or health outcomes, it is important to recognise that these associations do not necessarily imply causality. For example, psychiatric patients with less severe illness, and consequently better functioning social networks, may therefore have higher visitor numbers and shorter stays. Equally, children with poorer



relationships with their mothers may receive lower inpatient visit rates and suffer poorer emotional health.

### ***Impact of visits on health and wellbeing of visitors***

In addressing the question of the impact of visiting on visitors' health and wellbeing, the main conclusion is that there is an absence of evidence, rather than evidence of an absence of effect.

Changed family roles were sometimes cited as an impact of visiting,<sup>52 54 65</sup> and one study found that visitors of neurology patients had given up hobbies as a result of the 'changed rhythm of life' caused by the need for regular hospital visits.<sup>54</sup> The issue of children visiting ill parents was considered by two studies.<sup>40 65</sup> There was tentative evidence that denying children access to the ill parent can have short- and long-term adverse psychological effects,<sup>65</sup> and 97% of psychiatrists questioned were in favour of children being allowed to visit parents admitted for the treatment of mental illness.<sup>40</sup>

## **Conclusions and recommendations**

Donabedian (1973) defined accessibility to health care as "those characteristics of the resource that facilitate or obstruct use by potential clients."<sup>67</sup> Travel, parking and time costs, both monetary and non-monetary, are one such characteristic. Microeconomic theory predicts that the price of access will affect the level of demand (utilisation by patients or visits from friends or relatives) if access is price-elastic (or cost-elastic). The empirical studies reviewed here provide some support for view that access levels by visitors are sensitive to cost, but the review found no evidence on the relationship between monetary access costs and uptake of hospital services by patients.

The majority of patients attending for outpatient appointments use cars to access the hospital. In England, parking charges vary geographically and the parking experience can sometimes be an additional source of financial pressure, worry and stress. Parking charges are an important source of income for hospitals (typically around 0.25% of income) and the opportunity cost of dropping charges is a reduction in resources available for patient care. If hospitals charge less than the rate charged in nearby public car parks, this may lead to abuse by non-hospital users depending on the location of the hospital. Policing the hospital car parks to prevent this abuse would incur additional costs for the hospitals.

The parking experience appears to affect patient satisfaction principally when it is either very good or very bad. There may be scope for the government to encourage hospitals to do all they can to make the parking experience a good one. For example, they may require hospitals to comply with specific standards, or to provide financial incentives for them to do so. Hospitals could be encouraged to provide information on the Healthcare Travel Costs Scheme on the front page hospitals' website (perhaps also on Choose and Book), and all outpatient letters should include a reference to the Scheme. Parking charges and information on parking facilities could also be routinely reported, both in letters and on hospital websites. The government has already recommended that hospitals "give a clear, accessible statement of car parking policy including the availability of permits/season tickets",<sup>1</sup> and there may be scope for including questions on this issue routinely in patient satisfaction surveys conducted by the Care Quality Commission.

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# Appendices

## Appendix 1: Search strategies: Car parking / Inpatient visitor

Lisa Stirk, CRD

Date searched: 03/02/10

### Limits

– English language only

### Total records found

Car Parking – 238 (341 before deduplication) **car parking.enl**

Visitors – 293 (416 before deduplication) **visitors.enl**

### MEDLINE (Ovid)

#### 1950 – January Week 3 2010

Date searched: 03/02/10

Records found:

Car Parking – 147

Visitors – 202

### MEDLINE In Process (Ovid)

#### 5 February 2010

Date searched: 08/02/10

Records found:

Car Parking – 6

Visitors – 5

1. "Parking Facilities"/
2. parking.ti,ab.
3. (carpark\$ or (car adj park\$)).ti,ab.
4. (cost\$ adj2 (transportation or journey\$ or travel\$ or trip or trips or visit or visits or visiting) adj4 hospital\$).ti,ab.
5. or/1-4
6. exp "Costs and Cost Analysis"/
7. (cost\$ or econom\$ or fee or fees or charge or charges).ti,ab.
8. "Fees and Charges"/
9. 6 or 7 or 8
10. (hospital\$ or inpatient\$ or outpatient\$ or day case\$ or day surg\$).ti,ab.
11. 5 and 9 and 10
12. "Parking Facilities"/ec
13. out of pocket.ti,ab.
14. (patient cost\$ or private cost\$ or time cost\$ or monetary cost\$ or productivity cost\$ or travel cost\$ or transport\$ cost\$ or travel cost\$ or visit\$ cost\$ or park\$ cost\$).ti,ab.
15. 13 or 14
16. ((attend\$ or access\$) adj6 (hospital\$ or inpatient\$ or outpatient\$ or day case\$ or day surg\$)).ti,ab.
17. 15 and 16
18. 11 or 12 or 17
19. limit 18 to english language
20. Inpatients/
21. inpatient\$.ti,ab.
22. 20 or 21
23. Visitors to Patients/
24. visitor\$.ti,ab.
25. ((family or friend\$ or parent\$) adj2 visit\$).ti,ab.
26. or/23-25
27. 22 and 26
28. ((family or friend\$ or parent\$) adj3 visit\$ adj6 hospital\$).ti,ab.
29. 27 or 28
30. limit 29 to english language

**EMBASE (Ovid)****1980 – 2010 Wk 4**

Date searched: 03/02/10

Records found:

Car Parking – 87

Visitors – 116

1. parking.ti,ab.
2. (carpark\$ or (car adj park\$)).ti,ab.
3. (cost\$ adj2 (transportation or journey\$ or travel\$ or trip or trips or visit or visits or visiting) adj4 hospital\$).ti,ab.
4. or/1-3
5. exp "cost"/
6. exp health economics/
7. (cost\$ or econom\$ or fee or fees or charge or charges).ti,ab.
8. or/5-7
9. (hospital\$ or inpatient\$ or outpatient\$ or day case\$ or day surg\$).ti,ab.
10. 4 and 8 and 9
11. out of pocket.ti,ab.
12. (patient cost\$ or private cost\$ or time cost\$ or monetary cost\$ or productivity cost\$ or travel cost\$ or transport\$ cost\$ or travel cost\$ or visit\$ cost\$ or park\$ cost\$).ti,ab.
13. 11 or 12
14. ((attend\$ or access\$) adj6 (hospital\$ or inpatient\$ or outpatient\$ or day case\$ or day surg\$)).ti,ab.
15. 13 and 14
16. 10 or 15
- 17. limit 16 to english language**
18. exp hospital patient/
19. inpatient\$.ti,ab.
20. 18 or 19
21. visitor\$.ti,ab.
22. ((family or friend\$ or parent\$) adj2 visit\$).ti,ab.
23. 21 or 22
24. 20 and 23
25. ((family or friend\$ or parent\$) adj3 visit\$ adj6 hospital\$).ti,ab.
26. 24 or 25
- 27. limit 26 to english language**

**HMIC (Ovid)****January 2010**

Date searched: 08/02/10

Records found:

Car Parking – 61

Visitors – 33

1. parking.ti,ab.
2. (carpark\$ or (car adj park\$)).ti,ab.
3. (cost\$ adj2 (transportation or journey\$ or travel\$ or trip or trips or visit or visits or visiting) adj4 hospital\$).ti,ab.
4. or/1-3
5. (cost\$ or econom\$ or fee or fees or charge or charges).ti,ab.
6. (hospital\$ or inpatient\$ or outpatient\$ or day case\$ or day surg\$).ti,ab.
7. 4 and 5 and 6
8. out of pocket.ti,ab.
9. (patient cost\$ or private cost\$ or time cost\$ or monetary cost\$ or productivity cost\$ or travel cost\$ or transport\$ cost\$ or travel cost\$ or visit\$ cost\$ or park\$ cost\$).ti,ab.
10. 8 or 9
11. ((attend\$ or access\$) adj6 (hospital\$ or inpatient\$ or outpatient\$ or day case\$ or day surg\$)).ti,ab.
12. 10 and 11
- 13. 7 or 12**
14. inpatient\$.ti,ab.

15. visitor\$.ti,ab.
16. ((family or friend\$ or parent\$) adj2 visit\$).ti,ab.
17. 15 or 16
18. 14 and 17
19. ((family or friend\$ or parent\$) adj3 visit\$ adj6 hospital\$).ti,ab.
- 20. 18 or 19**

#### **EconLit (Ovid)**

**1969 - January 2010**

Date searched: 08/02/10

Records found:

Car Parking – 10  
Visitors – 0

1. parking.ti,ab.
2. (carpark\$ or (car adj park\$)).ti,ab.
3. 1 or 2
4. (nhs or hospital\$ or health\$ or medical).ti,ab.
5. 3 and 4
6. (cost\$ adj2 (transportation or journey\$ or travel\$ or trip or trips or visit or visits or visiting) adj4 hospital\$).ti,ab.
7. 5 or 6
8. out of pocket.ti,ab.
9. (patient cost\$ or private cost\$ or time cost\$ or monetary cost\$ or productivity cost\$ or travel cost\$ or transport\$ cost\$ or travel cost\$ or visit\$ cost\$ or park\$ cost\$).ti,ab.
10. 8 or 9
11. ((attend\$ or access\$) adj6 (hospital\$ or inpatient\$ or outpatient\$ or day case\$ or day surg\$)).ti,ab.
12. 10 and 11
- 13. 7 or 12**
14. inpatient\$.ti,ab.
15. visitor\$.ti,ab.
16. ((family or friend\$ or parent\$) adj2 visit\$).ti,ab.
17. 15 or 16
18. 14 and 17
19. ((family or friend\$ or parent\$) adj3 visit\$ adj6 hospital\$).ti,ab.
- 20. 18 or 19**

#### **PsycInfo (Ovid)**

**1806 – February Week 1 2010**

Date searched: 08/02/10

Records found:

Car Parking – 19  
Visitors – 60

1. parking.ti,ab.
2. (carpark\$ or (car adj park\$)).ti,ab.
3. (cost\$ adj2 (transportation or journey\$ or travel\$ or trip or trips or visit or visits or visiting) adj4 hospital\$).ti,ab.
4. or/1-3
5. (cost\$ or econom\$ or fee or fees or charge or charges).ti,ab.
6. (hospital\$ or inpatient\$ or outpatient\$ or day case\$ or day surg\$).ti,ab.
7. 4 and 5 and 6
8. out of pocket.ti,ab.
9. (patient cost\$ or private cost\$ or time cost\$ or monetary cost\$ or productivity cost\$ or travel cost\$ or transport\$ cost\$ or travel cost\$ or visit\$ cost\$ or park\$ cost\$).ti,ab.
10. 8 or 9
11. ((attend\$ or access\$) adj6 (hospital\$ or inpatient\$ or outpatient\$ or day case\$ or day surg\$)).ti,ab.
12. 10 and 11
13. 7 or 12
- 14. limit 13 to english language**

15. inpatient\$.ti,ab.
16. visitor\$.ti,ab.
17. ((family or friend\$ or parent\$) adj2 visit\$).ti,ab.
18. 16 or 17
19. 15 and 18
20. ((family or friend\$ or parent\$) adj3 visit\$ adj6 hospital\$).ti,ab.
21. 19 or 20

## **22. limit 21 to english language**

### **NHS Economic Evaluation Database**

#### **Cochrane Library 2010 Issue 1**

Date searched: 08/02/10

Records found:

Car Parking – 11

Visitors – 0

- #1 MeSH descriptor Parking Facilities explode all trees
- #2 (carpark\* or "car park\*"):ti or (carpark\* or "car park\*"):ab
- #3 (parking):ti or (parking):ab
- #4 (transportation or journey\* or travel\* or trip or trips or visit or visits or visiting) near/4 hospital\*:ti or (transportation or journey\* or travel\* or trip or trips or visit or visits or visiting) near/4 hospital\*:ab
- #5 (cost\*):ti or (cost\*):ab
- #6 (#4 AND #5)
- #7 (#1 OR #2 OR #3 OR #6)
- #8 MeSH descriptor Costs and Cost Analysis explode all trees
- #9 (cost\* or econom\* or fee or fees or charge or charges):ti or (cost\* or econom\* or fee or fees or charge or charges):ab
- #10 MeSH descriptor Fees and Charges explode all trees
- #11 (#8 OR #9 OR #10)
- #12 (#7 AND #11)
- #13 MeSH descriptor Parking Facilities explode all trees with qualifier: EC
- #14 "out of pocket":ti or "out of pocket":ab
- #15 "patient cost\*" or "private cost\*" or "time cost\*" or "monetary cost\*" or "productivity cost\*" or "travel cost\*" or "transport\* cost\*" or "travel cost\*" or "visit\* cost\*" or "park\* cost\*":ti or "patient cost\*" or "private cost\*" or "time cost\*" or "monetary cost\*" or "productivity cost\*" or "travel cost\*" or "transport\* cost\*" or "travel cost\*" or "visit\* cost\*" or "park\* cost\*":ab
- #16 (#14 OR #15)
- #17 (attend\* or access\*) near/6 (hospital\* or inpatient\* or outpatient\* or "day case\*" or "day surg\*"):ti or (attend\* or access\*) near/6 (hospital\* or inpatient\* or outpatient\* or "day case\*" or "day surg\*"):ab
- #18 (#16 AND #17)
- #19 (#12 OR #13 OR #18)**
- #20 MeSH descriptor Inpatients, this term only
- #21 (inpatient\*):ti or (inpatient\*):ab
- #22 (#20 OR #21)
- #23 MeSH descriptor Visitors to Patients, this term only
- #24 (visitor\*):ti or (visitor\*):ab
- #25 (family or friend\* or parent\*) near/2 visit\*:ti or (family or friend\* or parent\*) near/2 visit\*:ab
- #26 (#23 OR #24 OR #25)
- #27 (#22 AND #26)
- #28 (family or friend\* or parent\*) near/3 visit\*:ti or (family or friend\* or parent\*) near/3 visit\*:ab
- #29 (hospital\*):ti or (hospital\*):ab
- #30 (#28 AND #29)
- #31 (#27 OR #30)**

### **Index to Theses**

<http://www.theses.com/>

Searched 08/02/10. Last updated 8 January 2010

Records found:

Car Parking – 0

Visitors – 0



(parking or "car park" or carpark) and hospital\* 0  
(attend\* or access\*) and (hospital\* or inpatient\* or outpatient\*) 0  
inpatient\* and visit\* 0  
hospital and visitor\* 27 (0 relevant)  
inpatient\* and visitor\* 0

**Google Scholar**

<http://scholar.google.co.uk/>

Anne Mason, CHE

Date searched: 03/02/10

car parking hospital costs (patient OR visitor)

Records found;

Car parking / visitors – 37,000 (41 potentially relevant)

## Appendix 2: data extraction table: studies informing the review

**Table 1: Studies addressing car parking (Question 1) N=37**

Study	Disease area	Study type Year (data collection)	Country Setting N	Findings on parking /access costs
Anis 2000 <sup>68</sup>	Cardio-respiratory : asthma, chronic obstructive pulmonary disease (COPD), respiratory infections or cardiac conditions	Prospective cohort study 1997	Canada Hospital emergency department N=400	Mean costs (for users): travel/parking (\$17), taxi (\$31), ambulance (\$102), and childcare (\$172).
Beattie 02 <sup>31</sup>	Rehabilitation, physical therapy (exercises / equipment to help patients' physical abilities).	Patient satisfaction questionnaire survey Date not stated	US Outpatient clinics in physical therapy N=1900 (17 States)	Adequate time spent in patient care and the professionalism of the staff are more important for patient satisfaction than are the location of the facility, the quality of equipment, and the availability of parking. Environmental factors such as clinic location, parking, time spent waiting for the therapist, and type of equipment used were not strongly correlated with overall satisfaction with care.
Cantor 2006 <sup>13</sup>	Cancer, cervical	Prospective study, alongside clinical trial 2003	US Screening /diagnostic clinics N=930 (3 hospitals, 4 clinics)	Direct non-healthcare costs: time costs: transportation, child care costs, elder care costs, parking costs, and lost working time. 90% patients travelled by car: mean distance: 32 miles for a round trip (up to 200 miles). Median per patient travel cost: ~US\$10 (\$0.31/mile). Parking costs: not reported separately. Median hrs from work: ~3-4 / visit. Total direct non-healthcare costs per patient: US\$50-120 (lower for screening clinics and for community hospital setting).
Chase 2003 <sup>14</sup>	Diabetes (type I), glucose testing in adolescents	RCT comparing electronic test results submission vs. clinic visit Economics: CEA Date not stated	US Community setting vs. Hospital clinic N=70	Mean out of pocket expenses (mileage, parking, meals, hotel stays, and babysitting): US\$59 (range: 10–505) Clinic visit time: 95 min (range: 60 to 128) Parking costs not reported separately. School days missed: 0.4 days per patient. On average, parents missed 0.5 days of work per clinic visit.
Chataway 2006 <sup>18</sup>	Multiple sclerosis	RCT comparing home vs. outpatient administration of intravenous steroids for multiple-sclerosis relapses Economics: CEA 2003-2005	UK (England) Home vs. Outpatient clinic N=140	Costs assessed: transport (parking and congestion charge in London) and childcare £3/day parking; £5/day congestion charge Mean transport costs for hospital group: £59 (95%CI: 47–74) Mean distance: 13.8 miles (range 0.4–57.5 miles).
Coco 2007 <sup>69</sup>	Acute otitis media (inflammation of middle ear), paediatrics	Economics: Cost-utility analysis comparing 4 treatment strategies 2001	US Primary care N=300	Secondary source (1997 survey from Kaiser Permanente, N=300) used to populate model: Mean hrs work lost (parent)/episode: 5.6 hours Mean cost/episode for nonmedical costs (babysitting, day care, travel, parking, other): US\$13.
Dancey 2005 <sup>20</sup>	Cancer, malignant melanoma	Questionnaire survey, investigating patient views on follow up in outpatient vs. primary care settings 2002-3	UK (England) Outpatient clinics N=230	Car parking cited as barrier to clinic attendance by 19% of respondents

Study	Disease area	Study type Year (data collection)	Country Setting N	Findings on parking /access costs
Draper 1995 <sup>28</sup>	Multiple	Options for design of questionnaire patient satisfaction surveys Early 1990s	Australia Outpatients, A&E N variable (multiple surveys)	Physical environmental factors (e.g. parking) affected satisfaction when very good or very poor, e.g. difficulties in parking for A&E in urban settings. Environmental factors less important than quality of clinical communication.
Frew 1999 <sup>8</sup>	Cancer, colorectal	Questionnaire surveys 1997/8	UK (GB) Screening clinics at 12 locations across GB N=3,525	80% arrived by car, 2/3 accompanied (bus: 9.2%, taxi: 3.5%) Lost working time: patients (25%), companion (23%). Car journey length (round trip): 14.4 mile (22.8 km), 56 minutes. Mean travel costs: £6.10 Mean gross direct non-medical and indirect cost: £16.90. Mean overall gross cost per attendance (with escort): £22.40. Parking costs: not reported separately.
Friman85 <sup>26</sup>	Paediatric conditions	Before and after study of reminder package (letter, phone call and mailed parking pass, which parents would previously have collected from the clinic desk) Early 1980s?	US Hospital paediatric outpatient clinics N=5260	Reminder package effective in reducing missed appointment rates. Impact of mailed parking passes unclear.
Garvican,1998 <sup>21</sup>	Cancer, breast	Questionnaire survey 1996	UK (Scotland) Nurse-led specialist outpatient clinic (one hospital) N=100	28% (26/93) patients very satisfied with car parking, public transportation, or other access to the hospital.
Gordon 2005 <sup>33</sup>	Cancer, breast	Quasi-experimental study with questionnaire for cost data collection Economics: CUA 2004	Australia Community rehabilitation: (1) early, home-based physiotherapy intervention vs. (2) group-based exercise (N=31) and psychosocial intervention vs. No intervention N=275	Direct non-medical costs covered personnel, capital equipment, consumables, operating expenses, travel, parking and childcare. Mean travel cost (int 2 only): AUS103. Mean lost productivity (int 2 only): AUS\$54
Grimmer 1999 <sup>34</sup>	Physiotherapy for musculoskeletal conditions	Questionnaire surveys 1996-7	Australia Outpatient clinics at 8 public hospitals N=2,500 episodes	Use of private car and car parking associated with lower number of attendances. Direction of causality unclear (e.g. fitter individuals more likely to drive and less likely to need more sessions).
Grunfeld 1999 <sup>22</sup>	Cancer, breast	RCT 1994	UK (England) Hospital outpatient clinic vs. primary care clinic N=300	Significantly more patients in the hospital group incurred out-of-pocket expenses for car parking. % using car: Hospital group: 80% Primary care clinic: 58% Similar proportions took time off work, but hospital group took longer (more hours) because visit time was longer.

Study	Disease area	Study type Year (data collection)	Country Setting N	Findings on parking /access costs
Haynes 2001 <sup>17</sup>	Cataract surgery	Prospective cohort study 1999	UK (England) District hospital outpatient clinic vs. community hospital clinic (rural setting) N=400	70% travelled by car. Per patient travel costs higher for district hospital (£9) than for community clinic (£6). Parking charges 'trivial', possibly because incurred by companion (~80% in both groups). Not reported separately. Mean visit time (in hospital): 3.3 vs. 2.9 hrs Mean travel time longer for district hospital (37 min vs. 24 min). Median work time lost similar (5.0 vs. 4.8 hrs)
Haynes 2006 <sup>23</sup>	Cancer, breast, colorectal, lung, ovary or prostate cancer	Prospective cohort study 1999	UK (England) Hospital outpatient clinics, 8 hospitals N=700	87% travelled by car (including taxis and hospital cars), 5% by bus Mean travel time (exc. Parking): 28 min (20 SD) Mean parking time: 7.4 minutes (substantially more for some: 34%: >10 min; 4%:>30 min) "The difficulty in finding a parking space at the hospital was the most frequent negative comment made by respondents."
Hubbard 06 <sup>24</sup>	Cancer (various types)	Qualitative study of patient views on transport for cancer treatment. Part of wider evaluation of an innovative patient transport service (run by the Scottish Ambulance Service) for cancer patients in Glasgow. 2004-5	UK (Scotland) Outpatient in urban hospital N=13 (+ 1 carer)	Several respondents used the ambulance system because it was "difficult, if not impossible parking their own car in the hospital grounds or nearby. The inability to find a parking space was stressful." (p. 392). One patient said 'The stress of parking is worse than the bloomin' treatment.' There were anecdotal reports of patients incurring fines when parking inappropriately.
Jan00 <sup>70</sup>	Any	Discrete choice conjoint analysis (DCCA) survey Date not stated	Australia Public hospitals N=230	Single question on 'ease of access', linking parking and public transport. Significant negative association with choice of hospital, i.e. individuals are less likely to choose a hospital with good parking/transport facilities. Authors suggest that respondents may see a busy car park as a signal of hospital quality.
Kawasaki07 <sup>27</sup>	Hypertension	Cross sectional telephone survey of willingness to attend group medical visits 2004-5	US Hospital primary care clinic (willingness to attend) N=300	Offering a package including a free parking pass increased willingness to attend from 68% to 80% of respondents. Most respondents were female (79%) and African American (89%), with a monthly income of US\$1000 or less (75%). 19 /94 who initially declined indicated that parking / transportation subsidies would change their decision to attend. Package included reduced wait to see their physician, more time with their physician, and parking or transportation subsidies. .
Khunti 2006 <sup>9</sup>	Diabetes mellitus (type II)	RCT comparing near-patient (rapid) testing with normal laboratory testing for HbA1c Economics: CEA 2002-3	UK (England) Community (GP practice) vs. Hospital clinic N=620	Mean travel costs: mileage, fares and parking fees. No significant difference between the groups: intervention: £1.53; control: £1.32 Working time lost valued at £15/hr, non-working time at £5/hr. Time cost/visit: intervention: £9.58; control: £9.92 Total patient cost/visit: intervention: £52.47; control: £50.31. Companion time NR separately Parking time NR separately
Kwong 2005 <sup>36</sup>	Oral vitamin B12 for B12 deficiency	Questionnaires and interview to determine willingness to switch from injectable (hospital delivery) to oral (home delivery) use of vitamin B12. Date not stated	Canada academic family practice units / community health centre follow up questionnaire: N=39	Travel/ parking costs significantly associated with decision to permanently switch to oral therapy: (OR 8.66, 95% CI 1.15–65.30).

Study	Disease area	Study type Year (data collection)	Country Setting N	Findings on parking /access costs
Lambert 2004 <sup>71</sup>	Respiratory, paediatric influenza	Prospective cohort study 2001	Australia Various healthcare settings N=118	Results not reported per patient, but for whole sample. Total travel costs seeking health care: AUS\$210 Total parking costs: AUS\$13 Time away from work, pay lost: 82 hrs Time away from work, no pay lost: 179 hrs
Leikidou07 <sup>72</sup>	Various	Patient satisfaction survey analysed using stepwise regression. Assessed quality of care, external environment (including parking). 2005	Greece Hospital inpatient N=164	Poor parking facilities were significantly and negatively associated with satisfaction. Question on parking not reported.
Longo 2007 <sup>19</sup>	Cancer (breast, colorectal, lung or prostate)	Questionnaire survey on out-of-pocket costs 2001-3	Canada (Ontario) Outpatient cancer clinics N=280	Mean monthly parking /fares costs: parking/fares (CAN\$47, range: \$0–450) Travel mileage costs: CAN\$372 (\$0–6180).
Macmillan 05 <sup>4</sup>	Cancer, any	Questionnaire survey of UK cancer patients; qualitative study of 10 hospitals in England; audit of English 285 hospitals; 3 focus groups 2003-2004	UK / England Inpatient and outpatient hospital settings N: not stated	75% (92%) of UK (English) hospitals charge patients for parking 60% of UK hospitals that charge for parking do not provide concessions for cancer patients. Mean hourly charge: £1.22 (range: £0.30 to £4) Only 19% of UK hospitals inform patients about the Hospital Travel Costs Scheme (HTCS) Single biggest expense incurred by cancer patients is the cost of travel to hospital (mean: £380 during course of treatment).
Oz 01 <sup>29</sup>	Tertiary care	Patient satisfaction questionnaire survey Date not stated	US Hospital inpatient N=260 (11 hospitals)	Patients asked about cost of parking (0, v. expensive to 10, v. inexpensive), and 'ease of trip' (0, v. difficult to 10, v. easy). Summary over both questions: mean 7.5, range between hospitals: 4.5 to 9.6.
Roberts 1999 <sup>73</sup>	Cognitive impairment	Study design NR. Economics: CEA Date not stated	Canada Carers' homes: problem solving counselling for carers of people with cognitive impairment as an addition to usual community and respite services N=140	Annual carer expenditure on medications, devices, sitters, travel, and parking. Mean additional travel cost: CAN\$ 120 (80SD) Mean additional parking cost: CAN\$14 (77SD) Sitter cost: \$CAN780 (3900SD) Lost wages: \$CAN110 (600SD) NOTE: intervention delivered at home; travel/ parking associated with visiting relative in hospital/ nursing home.
Robinson 2007 <sup>10</sup>	Chlamydia screening programme	Prospective cohort study 2001-2	UK (England) GP surgery N=411	Per patient out of pocket cost: £6.82 (95%CI: £5.43 to £10.22) Mean car travel cost: £1.49 Mean bus travel cost: £1.06 Parking cost not reported separately. 59% would have been at work.
Rosko83 <sup>32</sup>	Any	Conjoint analysis of choice of health plans (2 techniques compared) Early 1980s?	US Hospital outpatient clinics N= 100 (students)	Free parking rated less highly than most other attributes (e.g. charges, waiting time, travel time, choice of physician).
Rundle04 <sup>30</sup>	End stage renal disease	Telephone interviews for patient satisfaction survey Date not stated	Ireland Outpatient clinics Dialysis units (haemodialysis)	Mean satisfaction with parking for outpatient clinics: 39% Mean satisfaction with parking in HD units: range across units: 33%, 75% and 100%

Study	Disease area	Study type Year (data collection)	Country Setting N	Findings on parking /access costs
			(HD) involves 3x 3hr visits/wk) N=190 (3 hospitals)	Main issues: expensive parking and lack of disabled / dialysis patient parking close to the hospital.
Scott 2007 <sup>11</sup>	Coronary heart disease	Cost evaluation alongside RCT of pharmacist-led medicines management intervention vs. usual care 2003-4	UK (England) Community pharmacist-led clinics N=1500 (38 GP practices)	Total mean patient costs per visit averaged £20-30. These costs included travel time, visit time, public transport fares and parking charges (not reported separately).
Shields 2004 <sup>15</sup>	Paediatric inpatients	Survey of 2 hospital catering and parking facilities Date not stated	Australia Hospital inpatient N: 2 (hospitals)	Parking and meal costs incurred by parents totalled >AUS\$200 /week. Parking AUS\$11-12/day  Note: "European Charter for Children in Hospital, which added 'Parents should not need to incur additional costs or suffer loss of income'" <a href="http://www.cirp.org/library/ethics/alderson/">http://www.cirp.org/library/ethics/alderson/</a>
Smit 2006 <sup>16</sup>	Depression, patients at high risk of first episode	RCT comparing screening for primary prevention with usual GP care 2003	Netherlands Hospitals N=200	Non-medical costs included travel and parking: unit costs: EUR 0.16/km and EUR2.50/h parking time. Annual per capita direct non-medical costs were EUR 441 (59SE) in the experimental group EUR 507 (77SE) in the control group (difference NS). Lost working time: EUR2374 (807SE) in intervention group; EUR3279 (697) in control group (difference NS)
Sturdee 2007 <sup>35</sup>	Orthopaedics, Femoral fractures in children	Quasi experimental with historical controls 1996-2002 (costs: 2004)	UK (England) Hospital inpatient, early intervention vs. traditional care N=66 (costs: 35)	Mean length of stay shorter in intervention group (10 days) relative to traditional group (29 days) Car travel costs (pp): £107 vs. £109 Mean car parking costs (pp): £29 vs. £135 Cost due to lost time: Females: £494 vs. £340 Males: £215 vs. £209
Taylor 2007 <sup>74</sup>	AMI, cardiac rehabilitation	RCT 2003-3	UK (England) Home-based vs. hospital based rehabilitation N=100	Travel cost (£0.60/mile): £50-60 for hospital group (80% of home based patients incurred zero travel costs) Parking costs not reported separately.
Thalanany 2006 <sup>12</sup>	Critical illness	Self-completed questionnaires on carers' out-of-pocket expenses and time foregone 2001-2002	UK (England) intensive care unit (ICU) N=107	54 responses received (50%) 59% carers in paid employment; 16% of these lost wages as a result of the visit (mean: £51/day). The mean cost of time foregone: £46.21/visit mean out-of-pocket expenses £29.30 89% travelled by car: journey cost ranged from £2 to £100. Parking cost incurred by 76%, ranged from £0 to £10.  "For example, comments given by participants showed some concern with car parking charges. While some daily visitors were worried about the costs involved (£1.05 for 4 hrs (\$1.52)) others felt that finding the right change was a problem and a cause of additional stress to them. Some felt that it was unfair to charge relatives visiting severely ill patients. One pensioner mentioned that since her husband's hospital admission she had spent more than £100 (\$145) in parking charges alone." (p46)

Study	Disease area	Study type Year (data collection)	Country Setting N	Findings on parking /access costs
Whynes 1996 <sup>25</sup>	Not specified	Analysis of survey data of GPs using Probit model to identify relevant hospital characteristics influencing fundholder's choice of referral destination. 1993	UK (England) GP fundholding practices N=100 (practices)	88 practices provided adequate data. Patient convenience (e.g. parking) and proximity of hospital were 2 of 4 significant hospital performance factors found to affect GP decisions. Quality of inpatient facilities NS. "In the survey, [fundholders] were invited to contribute written comments relating to hospital preferences and poor car parking facilities and inaccessibility by public transport were frequently mentioned as reasons for a low assessment on the patient convenience dimension. Being close is thus not entirely the same as being convenient."(p. 592)

**Table 2: Studies addressing visitors (Question 2) N=29**

Study	Disease area	Study type Year (data collection)	Country Setting N	Findings
Astedt-Kurki 1999 <sup>54</sup>	Neurology	Questionnaire survey of relatives of inpatients 1995	Finland Hospital inpatient N=70	Hospital visits "determine the rhythm of [visitors'] lives" and resulted in visitors giving up hobbies and changing roles in the family home (p. 159). Very few respondents viewed hospital visits as 'time consuming'.
Aujoulat 2006 <sup>65</sup>	Any	Literature review of health promotion of children and adolescent in hospital Date not applicable	Developed world countries Children / adolescents in hospitals N: not applicable	"Children of exhausted parents are at greater risk of not coping adequately with their disease and the psychosocial strain linked to it, as they are usually much aware of their parents' stress and, depending on their age, tend to react to it with a sense of responsibility and sometimes even guilt." (p 25) Children of critically ill relatives may have to take over a parental role at home. Some evidence that denying children access to the ill parent can have short- and long-term adverse psychological effects (p. 27).
Brooks 2000 <sup>60</sup>	Any	Questionnaire survey of verbal communication amongst inpatients 1998/9	UK (England) Acute inpatient setting N=277	One-third of participants did not speak or understand English and a further third understood limited English. When the interpreting service was unavailable, communication was primarily conducted through relatives and visitors (p. 707).
Callery 1997 <sup>52</sup>	Surgical paediatric patients	Interviews (parents and staff) to identify financial, social and personal costs of parental involvement in hospital care. Review of medical records. Date NR	UK (England) Inpatient surgical ward N=24 (pairs of parents) N=12 (staff)	Travel distance: 75% had to travel over 10 miles to the hospital (for 20% the distance was 10-30 miles). Around half of the mothers worked. In some cases, both parents used annual leave or took unpaid leave to care for their child. Reliance on other family members to care for siblings often caused additional strain.
Carroll 2009 <sup>38</sup>	Cardiovascular acute episode	Questionnaire survey of 'Patient's Perception of Visits in the Hospital' Date NR	US Cardiac intensive care units (CICU) and cardiac step down units (SDU) N=63 (CICU) N=61 (SDU)	CICU group valued visiting more, because visitors interpreted information (P<.02), were calming (P<.05), provided information about them to staff (P<.01), helped with care (P<.000), and reinforced treatments (P<.004). There were no differences in total stressor score CICU patients worried more about their visitors travelling (P<.025). SDU patients perceived that visitors were disruptive to rest (P<.001) and that visitors intensified their pain (P<.008). The majority of patients preferred unlimited visiting hours, with 3 visitors at a time, and some limits on children. Text data identified unlimited visiting for close family members, the benefit of support from visitors, and the stress of lengthy visits.
Cross 1974 <sup>45</sup>	Geriatric patients Psychiatric patients	Cross sectional observational study 1972	UK (England) Geriatric units, psychiatric units in rural location N=220 (short stay patients, geriatric) N=255 (long stay patients, geriatric) N=96 (short stay patients, psychiatric) N=383 (long stay patients, psychiatric)	Whereas greater distances between home and hospital (up to 20 miles) resulted in little reduction in the frequency of visiting of short-stay (less than six months) geriatric patients and of both short and long-stay psychiatric patients, they resulted in much less frequent visiting of long-stay geriatric patients.



Study	Disease area	Study type Year (data collection)	Country Setting N	Findings
Daniels 1984 <sup>57</sup>	Neonatal special care	Case series study of parental visits and telephone calls. Date NR	Belgium Neonatal special care unit N=61 (parents of 75 preterm infants)	Travel distance: median 30km (range: 1 to 130km) Inpatient duration: median: 47 days (range: 5 to 140) The rates of visits per week dropped significantly with increasing distance, the rates of telephone calls increased with increasing distance (not significant). The frequency of visits and calls was stable after the first week.
Ebringer 1980 <sup>43</sup>	Mental illness	Cross sectional survey of psychiatric inpatients 1975/6	UK (England) Psychiatric inpatient N=74	37% had no visitors, suggesting that many had lost their social support. Patients staying longer than 3 months were significantly less likely to have had a visitor than short stay patients.
Eriksson 2007 <sup>49</sup>	Critical illness	Prospective observational study 2004	Sweden intensive care unit (ICU) N=200	25% of the patients had no visitors, no effect on outcomes detected. 47% of the patients who had visitors <=30 mins/day, 36% had visits of between 0.6 and 2 h/day and 17% had visits of >2 h/day. The most frequent visitors were spouses and children. Patients who had no visitors were older, had a shorter ICU stay and more often lived alone. There were no significant differences in mortality and length of hospital stay over time.
Giacoaia 1985 <sup>53</sup>	Preterm infants	Cross sectional observational study 1983-1984	US Paediatric intensive care N=167 (admitted patients) Group A: inborn (resident within city) Group B: out-of-town (resident outside city)	Decline in visit rate for intensive care infants when distance exceeded 50 miles. "Frequency of visits was correlated to social class. The most commonly identified factors limiting visiting were care of siblings, demands of work, cost of the trip, and distance." Mean travel distance (miles): Group A: 12 (SD 7.6) (94% used car) Group B : 79 (SD 40) (87% used car)  Mean number of weekly visits Group A: 6.6 (range 1.7- 16.5) Group B : 3.6 (range 0.1- 12.4)  Total cost of visiting during hospitalization Group A: US\$135 (range 6-649) Group B: \$328(range 13-1523)
Gonzalez 2004 <sup>39</sup>	Critical illness Rehabilitation (complex care needs)	Structured interviews to elicit patients' preferences for visiting. Date NR	US intensive care unit and in a complex care medical unit N=62 (half in each unit)	In both units, visitors offered moderate levels of reassurance, comfort, and calming. Patients in the intensive care unit worried more about their families than did patients in the complex care medical unit but valued the fact that visitors could interpret information for the patients while providing information to assist the nurse in understanding the patients. Patients in the intensive care unit were more satisfied with visiting practices than were patients in the complex care medical unit, although both groups preferred visits of 35 to 55 minutes, 3 to 4 times a day, and with usually no more than 3 visitors.
Hellerstein, 2008 <sup>47</sup>	Mental illness, various	Review of psychiatric admission responses to Coping Agreement Questionnaire 2001	US Psychiatric inpatient N=264	Adolescent patients were more often upset by not having visitors (39%), whereas elderly patients reported being upset by having visitors. Females significantly more likely than males to report loneliness or lack of visitors as a trigger for loss of control.
Latva, 2004 <sup>63</sup>	Preterm infants	Follow up study of effect of parental visits for preterm infants born in 1989 1996-1997	Finland Community; neonatal intensive care unit	Visits (median): 6.2 day/wk (mothers), 4.7 day/wk (fathers) Children whose mothers visited daily had fewer behavioural and emotional problems at school age than those who had had fewer visits from their mothers

Study	Disease area	Study type Year (data collection)	Country Setting N	Findings
			N=47	(P=.04). Visiting frequency of fathers not significantly associated with later behavioural and emotional problems of the child.
Latva, 2007 <sup>58</sup>	Preterm infants	Case series study of visits to preterm infants born 1997-1998	Finland Neonatal intensive care unit N=37	Inpatient stay: 2 to 133 days (median 26, quartiles 19, 45). Visits (median) 6.7 day/wk (mothers); 4.8 day/wk (fathers). Mothers visited less frequently the lower the gestational age and the longer the distance between home and hospital. Fathers visited less frequently if distance from home to hospital was longer and if the infant had siblings.
Leader, 2002 <sup>55</sup>	Paediatric infants with respiratory syncytial virus	Feasibility study: face-to-face interviews and telephone follow up interviews with carers 2000 to 2001	US Paediatric intensive care N=85 (infants)	Caregivers reported incurring time and monetary costs associated with travel and time spent in the hospital, missed work, parking fees, hospital meals, payments for child care, copayments for doctor visits, and prescriptions. Quantities / prices not reported.
Nawata, 2006 <sup>46</sup>	Mental health, schizophrenia	Cohort study exploring impact of visit frequency and relationship of main visitor on days hospitalised. Patients followed up 6 years later. Regression analysis (CART) of data with % FU period hospitalised as dependent variable. 1993, 1999	Japan Psychiatric inpatient N=18 (hospitals) N=1131 (patients)	Note: Japan retains a high number of psychiatric beds and a high rate of long stay psychiatric patients relative to other developed countries.  Findings dichotomised into those with continuous stay group (average % FU period hospitalised >90%) and intermittent stay group (54%).  Continuous stay group less likely to have had weekly visits in period 1 (3% vs. 36%), and more likely to have visits from a sibling (37% vs. 16%).  Continuous stay group less likely to be visited in period 1 by a parent (27% vs. 69%) or spouse (1.4% vs. 16%) and more likely to have no visitors (36% vs. 0%).  "the reason why the percentage of followed-up period hospitalized was low for the intermittent group appeared to be related to better relationship with their families."  Direction of causality unclear. All patients had a diagnosis of schizophrenia but findings not adjusted for severity.
Olsen, 2009 <sup>48</sup>	Critical illness	Semi-structured interviews 2006-2007	Norway Intensive care unit N=11	"The patients desired some limitation of visitors' presence and preferred visits only from those who were closest in daily life. Visits had a variety of functions for intensive care patients, including promoting support for patients and families. However, visits also caused stress for patients and worries about creating stress for family members."
O'Shea, 2004 <sup>40</sup>	Mental health	Questionnaire survey of psychiatrists eliciting views on visits by children (aged <12) of acutely disturbed adult psychiatric patients Date NR	Republic of Ireland / Northern Ireland Psychiatric inpatient units N=148 (psychiatrists)	97% in favour of children visiting. 46% thought that decisions on visits should depend on the particular situation, considering the child, parent, ward, etc. 11% of units had a room/area designated for children visiting. 90% had no facilities they considered child-friendly on their unit.
Richter, 2007 <sup>66</sup>	High-risk antepartum patients	Interviews with hospitalized women with a high-risk pregnancy Date NR	Canada Specialist antenatal unit N=13	Families living in rural areas had to make special arrangements to visit during weekends, and accommodation arrangements placed a burden on their finances. Stress from noise of others' visitors staying late.

Study	Disease area	Study type Year (data collection)	Country Setting N	Findings
Rode, 1981 <sup>62</sup>	Premature or critically ill newborns	Cohort study of attachment patterns of babies separated from their mothers at birth because of prematurity or illness Date NR (follow up at ~18 months)	US Neonatal intensive care unit N=24 (infant/mother dyads)	Most families lived a "considerable distance" from the NICU; parental visiting patterns varied from one visit prior to discharge to daily visits. The secure versus insecure attachment groups could not be differentiated on the basis of number of visits. Small sample size limits validity of findings.
Russo, 1997 <sup>61</sup>	Mental health, acute episodes	Regression analysis of cohort study of acute inpatients 1994-1995	US Acute psychiatric hospital inpatient N=1050	Frequency of family visits was the strongest functional quality-of-life predictor, relating to positive outcomes. Higher frequency of visits from friends or family was associated with lower rates of rehospitalisation and lower length of stay. There was no relationship between visit frequency and psychiatric assessment score.
Smith, 1983 <sup>56</sup>	Premature or critically ill newborns	Prospective survey of parent visiting 1980	UK (England) Special care baby units N=125 (babies either inborn or transferred in, 'outborn') N=6 (hospitals)	<b>Mean cost of visiting</b> By car (inborn): £41 (range 1-336) By car (outborn): £123 (range 11-518) By public transport (inborn): £30 (range 2-151) By public transport (outborn): £46 (range 16-80) (assumes cost/mile of 9.2p)  <b>Distance travelled (miles):</b> One way for single journey: 19 (range 0 to 83) Total mean distance (episode of care) Inborn: 26 (2-166) Outborn: 82 (range 0-160)  <b>Travel time</b> (round trip, hrs): 1 (range 10 min to 6 hrs)
Sulmasy, 2001 <sup>50</sup>	Critical illness with poor prognosis (cancer, AIDs, heart failure, COPD, advanced dementia)	Observational study using time-lapse video cameras 1996-1997	US Medical hospital inpatient N=58	Mean daily visit duration by family (mins): 24 (51 SD) Mean number person-visits by family/day: 13 (21 SD)  Patients with advanced dementia and ethnic minority patients had significantly lower family visitor time.
Tanner, 2005 <sup>42</sup>	Various	Questionnaire survey of patients, visitors and staff on visiting duration. Date NR	UK (England) Inpatient adult wards N=863 (432 nursing staff, 227 patients, 204 visitors)	35% of patients were embarrassed about receiving nursing care in front of visitors, but only 13% of visitors found the situation embarrassing; 33% of patients did not like visitors to be present at mealtimes. 35 % of patients found their visitors tiring and 30% thought visitors stayed too long Nurses, patients and visitors did not prefer open visiting as first choice, preferring to have a rest period.
Taylor, 2008 <sup>41</sup>	Cancer	Questionnaire survey of patients, visitors and staff Date NR	UK (England) Regional oncology centre N=145 (50 visitors, 50 patients, 45 staff)	Visiting makes the patient tired (% agreeing): patients (38%), visitors (22%), staff (100%) No visitors should be allowed at mealtimes (% agreeing): patients (88%), visitors (78%), staff (100%) Visiting to the ward should be open (% agreeing): patients (26%), visitors (36%), staff (7%) Visitors need more education on infection control (% agreeing): patients (78%), visitors (78%), staff (92%)

Study	Disease area	Study type Year (data collection)	Country Setting N	Findings
Tschann, 2003 <sup>51</sup>	Terminal illness	1 year retrospective cohort study of patients aged >49 who died during inpatients study hospital 1997	US Inpatient ward of community hospital N=370	"The presence of a family member at death appears to be an indirect measure of family involvement during patients' hospitalization. Family involvement before death may reduce the use of technology and increase the use of comfort care as patients die." No statistical relationship with presence of family member at death and length of stay.
Wiener, 1999 <sup>44</sup>	Mental illness Acute illness	Retrospective cohort study of female inpatients Date NR	UK (England) Inpatient medical wards in two London hospitals N=33 (psychiatric inpatients) N= 23 (medical inpatients)	Medical patients received significantly more flowers: odds ratio 8.8 (95%CI 1.6 to 64.2); get-well-soon cards: OR 5.7 (95%CI 1.4 to 25.3) and other gifts: OR 5.7 (95%CI 1.4 to 23.6). Psychiatric patients received fewer visitors than the medical patients (median 4 vs 10, OR 0.3, 95%CI 0.1 to 0.9). The results suggested that during hospital admissions, the behaviour of relatives and friends of mentally ill patients is rejecting.
Wilson, 2006 <sup>59</sup>	Cancer	Interviews during admission and 4-8 weeks post discharge Date NR	UK (England) Regional cancer centre N=26 (patients) N=15 (carers)	Informal, often supportive, interaction between patients and fellow patients, and their carers/visitors, takes place in the wards, departments and outpatient facilities of cancer hospitals on a daily basis but this has remained largely invisible and unanalysed. Visitors recognised negative emotions such as worry, fear and low mood in other patients/visitors and were often prepared to address them. Coping with stigma and maintaining links to the outside world.
Ziegler, 1982 <sup>64</sup>	Paediatric inpatients	Quasi-experimental study with matched controls: foster grandparent visitor; 'under-visited'; parental visitor Date NR	Canada Paediatric acute inpatient unit N=67 (children)	The children were not observably more responsive, happier, or more tranquil for having had foster grandparent visitors. Group with parent visitor significantly more likely to encourage children to play than under-visited group or foster grandparent visited group. Small numbers in each group, and unclear that study was properly controlled – internal validity questionable.

### Appendix 3: studies not retrieved

Given the short timescale for this review, it was not possible to request interlibrary loans (paper photocopies) for articles that were unavailable online. Studies considered potentially relevant, but that were not retrieved for this reason, are listed below.

#### Car parking search

- Bechel D, Myers WA, Smith DG. Does Patient-Centered Care Pay Off? Joint Commission Journal on Quality and Patient Safety, Volume 26, Number 7, July 2000, pp. 400-409(10).
- Close P, Burkey E, Kazak A, Danz P, Lange B. A prospective, controlled evaluation of home chemotherapy for children with cancer. *Pediatrics* 1995;95(6):896-900
- Cunningham CE, Bremner R, Boyle M. Large group community-based parenting programs for families of preschoolers at risk for disruptive behaviour disorders: utilization, cost effectiveness, and outcome. *Journal of Child Psychology and Psychiatry and Allied disciplines* 1995;36(7):1141-59.
- Deutekom M, Dobben AC, Dijkgraaf MG, Terra MP, Stoker J, Bossuyt PM. Costs of outpatients with fecal incontinence. *Scand J Gastroenterol.* 2005 May;40(5):552-8.
- Heitman S, Manns B, McGregor S, Hilsden R. Nonmedical Costs of Colorectal Cancer Screening With the Fecal Occult Blood Test and Colonoscopy. *Clinical Gastroenterology and Hepatology*, Volume 6, Issue 8, Pages 912-917.
- Koch H, Higgs A. What Does Quality Health Care Cost? *International Journal of Health Care Quality Assurance.* 1991 (4) 4-8.
- Mitchell-DiCenso A, Guyatt G, Marrin M, Goeree R, Willan A, Southwell D, et al. A controlled trial of nurse practitioners in neonatal intensive care. *Pediatrics* 1996;98(6):1143-48.
- Oestreicher N, Ramsey SD, Linden HM, McCune JS, Van't Veer LJ, Burke W, et al. Gene expression profiling and breast cancer care: what are the potential benefits and policy implications? *Genetics in Medicine* 2005;7(6):380-89.
- Smith AC, Youngberry K, Christie F, Isles A, McCrossin R, Williams M, et al. The family costs of attending hospital outpatient appointments via videoconference and in person. *Journal of Telemedicine & Telecare* 2003;9 Suppl 2:S58-61.
- Stothers L. A randomized trial to evaluate effectiveness and cost effectiveness of naturopathic cranberry products as prophylaxis against urinary tract infection in women. *Canadian Journal of Urology* 2002;9(3):1558-62.
- Suh WW, Hillner BE, Pierce LJ, Hayman JA. Cost-effectiveness of radiation therapy following conservative surgery for ductal carcinoma in situ of the breast. *International Journal of Radiation, Oncology, Biology, Physics* 2005;61(4):1054-61.

#### Visitors search

- Anon. (1993). "Too dear to visit: a campaign by Action for Sick Children and Contact a Family." *Cascade* January: 4-5.
- Belson, P. (1993). "Children in hospital." *Children and Society* 7(2): p196-210.
- Brown, L. P., R. York, et al. (1989). "Very low birth-weight infants: parental visiting and telephoning during initial infant hospitalization." *Nursing Research* 38(4): 233-6.
- Callahan, E. J., W. S. Brasted, et al. (1991). "Prolonged travel time to neonatal intensive care unit does not affect content of parental visiting: a controlled prospective study." *Journal of Rural Health* 7(1): 73-83.
- Carlile, J. B. (1993). "The reduction of violence in a chronic psychiatric inpatient group: a social technique." *Canadian Journal of Psychiatry - Revue Canadienne de Psychiatrie* 38(2): 103-7.
- Castleberry, K. (1988). "Helping children adapt to the psychiatric hospitalization of a parent." *Psychiatric Hospital* 19(4): 155-60.
- Chu, C.-c. and H. E. Klein (1985). "Psychosocial and environmental variables in outcome of Black schizophrenics." *Journal of the National Medical Association* 77(10): 793-796.
- Fischer, H. and D. Allasio (1994). "Restricting parents' visits to children hospitalized for abuse or neglect: a survey." *Journal of the National Medical Association* 86(11): 807.
- Garrouste-Orgeas, M., F. Philippart, et al. (2008). "Perceptions of a 24-hour visiting policy in the intensive care unit." *Critical Care Medicine* 36(1): 30-5.
- Glenn, M. L. (1982). "Family illness rituals." *The Journal of Family Practice* 14(5): 950-954.
- Hawthorne, J. T., M. P. M. Richards, et al. (1978). "A study of parental visiting of babies in a special-care unit." *Clinics in Developmental Medicine*.

- Heitman, L. and C. McClard (2009). "Innovative solutions--the art of improvisation: patient and family preferences for visitation in critical care." *DCCN - Dimensions of Critical Care Nursing* 28(3): 110-1.
- Hymovich, D. P. (1993). "Child-rearing concerns of parents with cancer." *Oncology Nursing Forum* 20(9): 1355-60.
- Kaushal, V. and S. Gupta (1995). "A study of visitors in inpatient area of a teaching hospital beyond visiting hours." *Journal Academy of Hospital Administration* 7-8(2-1): 35-41.
- Lopez, J. and S. Hendrickson (1991). "Family visits and different cultures." *AXON* 12(3): 59-62.
- Lord, R. and J. Schowalter (1979). "Visiting on an adolescent ward." *Journal of the Association for the Care of Children in Hospitals* 8(1): 5-9.
- Pryor, J. (2004). "What environmental factors irritate people with acquired brain injury?" *Disability and Rehabilitation* 26(16): 974-980.
- Scobie, W. G. and W. M. Garraway (1979). "Day case surgery for children." *Nursing Times* 75(6): 252-254.
- Simpson, T. (1991). "Critical care patients' perceptions of visits." *Heart & Lung* 20(6): 681-8.
- Sivec, H. J., P. Masterson, et al. (2008). "The response of children to the psychiatric hospitalisation of a family member." *AeJAMH* 7(2): 1-9.

## Part 2: The impact of access costs on hospital utilization

### Background

Part 1 (Hospital Car Parking) of the review was unable to identify evidence on the impact of monetary access costs on utilisation of hospital services. Therefore, the Department of Health requested a rapid review of the evidence on the impact of access costs – proxied by distance or time if necessary – on the utilisation of hospital services, with a particular focus on outpatient services. These findings are reported in Part 2.

### Introduction

The 1946 NHS Act stated that availability of care should not be dependent on the patient's place of residence.<sup>1</sup> Since then, several key policies that were designed to improve patient care have resulted in patient's residence affecting the costs they face in accessing care. For instance, the 1962 Hospital Plan recognised that radiotherapy and thoracic surgery needed larger catchment areas and recommended that these be provided only in certain district hospitals<sup>2</sup> and the 1995 Calman-Hine Report recommended the consolidation of specialist cancer services into fewer, larger units with more specialist knowledge, better facilities and sufficient patient throughput to promote expertise and so improve outcomes. These, and similar policies such as patient choice and service reconfiguration for emergency services, have raised concerns that access costs may be geographically inequitable and provide the context for several key studies of the effects of distance on access and uptake.

### Objectives

This rapid review aimed to identify evidence from the UK relating to the impact of access costs on the utilisation of secondary care services. Specifically, the review explored whether the evidence base addressed the following questions:

- Does effect vary by the nature of the disease (e.g. life-threatening; long-term conditions, minor illness)?
- Does effect vary by disease stage / position in the care pathway (e.g. preventative care, first outpatient appointment, palliative care etc)?
- What impact do access costs have on health outcomes?
- Do studies assess productivity losses in their analyses?

### Methods

Searches were run on 8 electronic databases (see appendix 2). A web-based search of Google scholar was also undertaken, because this approach allows the full text of articles to be searched (rather than just the titles, abstracts and key words). Reference lists of literature reviews were checked for relevant missing UK studies.

Studies were eligible for inclusion if they considered how the costs of accessing care (in terms of money, time or distance) impacted uptake of services.

## Results

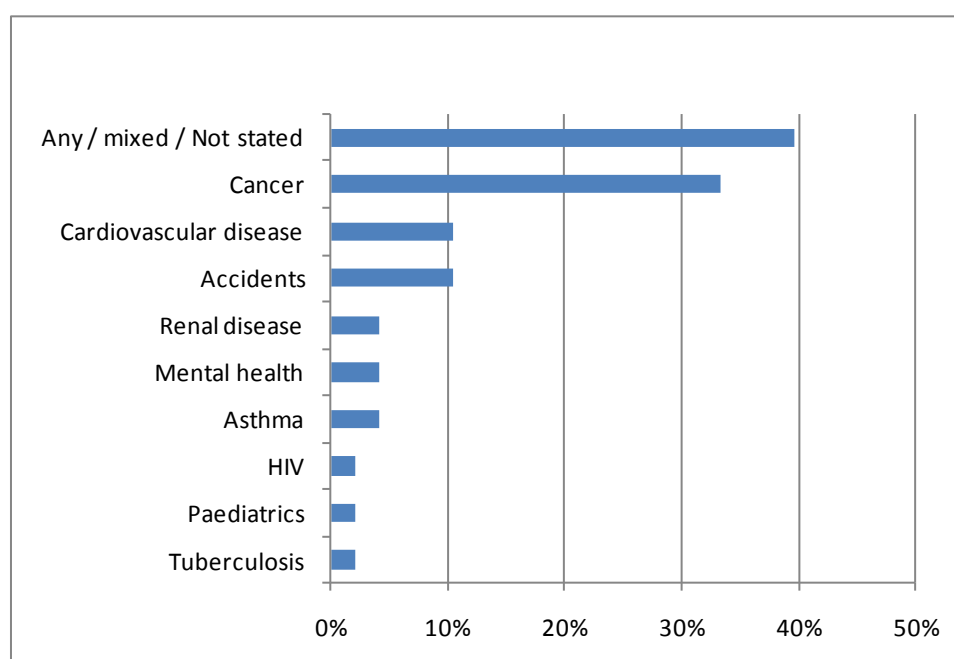
### Overview of the literature

The searches identified 584 references. Seven were literature reviews<sup>3-9</sup> and 70 potentially relevant studies were identified. On further scrutiny, 21 of these 70 were found to be irrelevant and were excluded (see Appendix Table 2).<sup>1 10-29</sup> Therefore, 49 papers covering 48 separate studies were included in the review (Table 3).<sup>2 30-77</sup> Figure 5 and Figure 6 show the disease areas and settings covered by these 48 studies, and Figure 7 shows the number of studies published in each five-year band. The data extracted from these studies are shown in **Appendix Table 1**.

Findings from the review are presented according to the study questions listed above. As one-third of the included studies addressed cancer services, the evidence for the effects of access costs on cancer services is then summarised as a case study.

**Table 3: Search results**

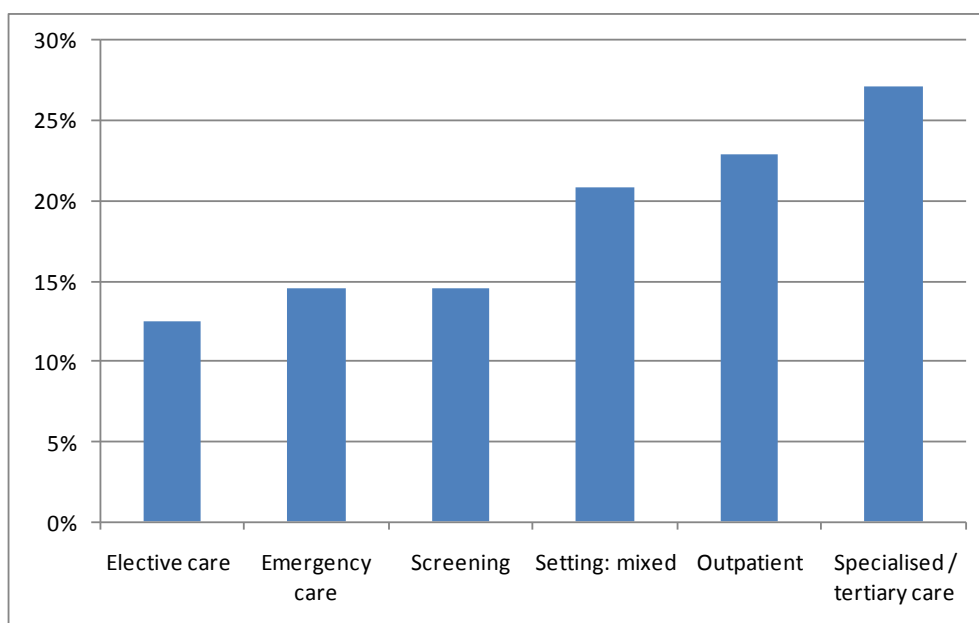
Database	Date searched	Hits	Records imported to Endnote	Articles included in review
MEDLINE (Ovid) 1950 – May Week 4 2010	08/06/2010	363	356	18
MEDLINE in Process(Ovid) June 07 2010	08/06/2010	18	18	0
EMBASE (Ovid) 1980 – 2010 Week 22	08/06/2010	323	88	2
HMIC (Ovid) January 2010	08/06/2010	57	25	4
EconLit (Ovid) 1969 – May 2010	08/06/2010	23	12	0
PsycInfo (Ovid) 1806 – June Week 1 201	08/06/2010	91	44	1
NHS EED (Cochrane Library) 2010 Issue 5	08/06/2010	7	6	0
Index to Theses (LS search)	08/06/2010	29	0	0
Index to Theses (AM search)	07/06/2010	23	1	1
Google scholar	08/06/2010	23	15	10
References identified from bibliographies / colleagues			19	13
<b>Total</b>		<b>957</b>	<b>584</b>	<b>49</b>



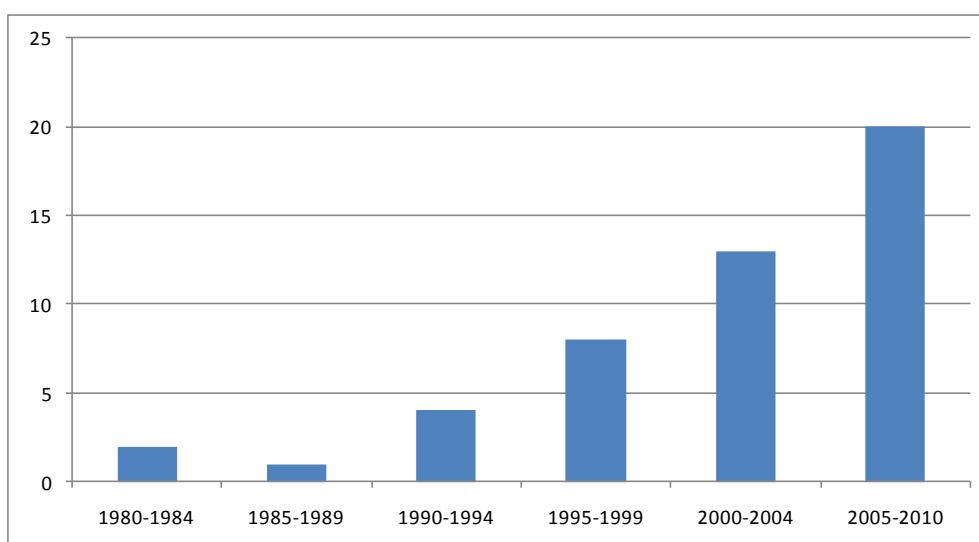
**Figure 5: Disease areas covered by the included studies (N=48)**

Note: some studies addressed more than one disease area





**Figure 6: Clinical settings covered by the included studies (N=48)**  
 Note: some studies addressed multiple settings (e.g. elective and emergency care).



**Figure 7: Year of publication of the included studies (N=48)**

## Key findings on the effect of access costs on utilisation

### Findings from previous reviews

- Previous reviews found that the quality of the study is critical to the interpretation of its findings. Studies that fail to adjust appropriately for confounding factors are likely to draw spurious conclusions. Studies published more recently are likely to be more reliable than older studies because methodologies, computational capacity and data availability have improved over time.
- Recent advances in the availability of detailed geographically disaggregate data and new location-based techniques such as developments in Global Positioning Systems (GPS) mean that more realistic and accurate assessments of distance (a proxy for access cost) are feasible.
- Previous reviews have identified a “distance-decay” relationship (i.e. as distance increases, utilisation decreases)<sup>3</sup> for both propensity to attend at all and for frequency of usage which seems to be related to severity and urgency.<sup>7</sup>
- Existing reviews have not summarised the literature by disease area, disease severity or by position in the care pathway.

### What this review adds: methodological insights

- The evidence comprises chiefly of data analyses from observational cohort studies. Despite improvements in methodologies, computational capacity and data availability, this type of study carries an unavoidable risk that unknown biases may influence findings. Known biases can be controlled for, providing that adequate data are available. However, routine data are rarely available for some important confounders, such as tumour grade.
- Many studies are undertaken to evaluate policy initiatives, such as the centralisation of specialist services, or aim to address concerns about inequities in access to care.
- Most studies adjust for deprivation, because this is a recognised driver of utilisation rates. However, the instrument used to assess deprivation can influence findings, suggesting that it may be particular aspects of deprivation that affect uptake, rather than deprivation *per se*.
- Further comments on the methodological issues affecting this evidence base are noted in Appendix 4: methodological issues and developments.

### What this review adds: evidence on effects

- There is no direct evidence on how access costs differentially impact different types of diseases. Although studies covered different types of disease, they used different methodologies, data sources and time frames, so it is difficult to draw robust conclusions. There was no good quality evidence on 'minor' disease.
- No study that quantified access costs in monetary terms met the inclusion criteria for the review (i.e. addressed the question of the impact of cost on utilisation). Unsurprisingly, studies that assessed monetary costs did so only for those using services (and not non-users). Therefore, the evidence presented here typically proxies access cost by distance or by travel time.
- A discrete choice experiment of hypothetical preferences suggests that patients are willing to trade off distance against waiting time; travel time rather than monetary cost appears the more important influence on decisions to use services.<sup>5</sup>
- Findings from more recent studies suggest that access cost, proxied by distance or travel time, significantly lowers the rate of utilisation of emergency services, elective care, outpatient attendances, and non-specialist inpatient services. However, most studies of screening programmes found no evidence of an effect and evidence on specialist services was mixed. Although need and deprivation are more important explanatory factors for uptake, studies that adjusted for these potential confounders found that access costs do affect utilisation.
- There is evidence of an interaction effect between deprivation and access cost for both outpatient care<sup>46</sup> and inpatient services.<sup>45</sup>

### ***Does effect vary by the nature of the disease?***

The impact of access costs on utilisation may vary by the nature of the disease, e.g. by whether the condition is life-threatening, a long-term condition, or a minor illness etc.

To answer this question, a study would need to use a common methodology across different disease areas and report findings separately. Nineteen studies analysed data on multiple conditions,<sup>34 36 39-42 46 49 52-54 56 61 63 67 68 70 71 73</sup> but many did not specify which conditions were included in their analyses. Where different conditions were specified, no study addressed this question or reported disaggregated findings. For example, a study by Bond and colleagues (2000)<sup>34</sup> looked at the impact on outpatient attendance rates when specialist clinics were held in GP surgeries instead of in hospitals. Although a range of specialities were considered, the study did not report findings separately by speciality.

An alternative approach would be to compare studies of similar design that evaluated different diseases. The included studies did address different disease areas, such as cancer, HIV, TB, renal disease and accidents (Figure 5). However, these conditions are all potentially life-threatening and may also be chronic conditions. One study<sup>69</sup> explicitly addressed a non-life threatening condition (minor trauma), but inadequacies in the data, study design and measures of distance mean findings should be treated with caution.

Therefore, the evidence found in this review cannot answer this study question.

***Does effect vary by disease stage/position in the care pathway?***

**Screening:** most studies find that distance has no effect on utilisation of screening. One cancer study found a small effect after adjusting for deprivation (which is an important explanatory factor for uptake), but the effect was small and was statistically significant only when distance was measured as a continuous – as opposed to a categorical – variable.<sup>65</sup> Mobile screening units for cancer do not appear to improve uptake rates relative to hospital-based screening.

**Emergency events:** there was evidence that patient use of accident and emergency (A&E) services is negatively related to distance<sup>36 42 54</sup> and a study of asthma found that a lower rate of A&E utilisation was associated with worse health outcomes.<sup>57</sup>

**Elective care:** six studies provided evidence on the effects of access costs on use of elective care.<sup>45 56 70-72 76</sup> Two studies from the 1980s found no evidence of an effect,<sup>56 76</sup> but more recent analyses found that more deprived patients make fewer longer journeys for elective treatment<sup>70</sup> and that travel time is a more important influence on decisions to utilise services than monetary cost.<sup>5</sup>

**Outpatient care:** well-controlled studies find that increasing distance is associated with lower attendance rates<sup>34 46 75</sup> and bringing outpatient care closer to home appears to improve attendance rates.<sup>34</sup> Findings that there is no association between attendance rate and distance travelled is reported by studies that did not fully adjust for confounding factors (e.g. Hambridge 1992<sup>50</sup>). One small retrospective study found that both an increase in the number of appointments made, and the distances involved in attending these, increased the number of missed appointments.<sup>44</sup> In the case of attendance for radiotherapy for cancer, one study found that there was no effect by distance but that availability of public transport appeared to be an influencing factor for a minority of patients.<sup>72</sup> Two studies found that that distance had no effect on attendance rates for chemotherapy.<sup>2 45 59</sup>

**Inpatient care (non specialist services):** findings on the impact of access cost on utilisation were mixed, with nine studies reporting a significant negative relationship,<sup>45 49 52 53 58 61 62 71 73</sup> two finding no effect<sup>39 56</sup> and one finding that distance affected length of stay but not likelihood of admission.<sup>76</sup>

**Specialist/tertiary care:** many studies did not assess utilisation directly, but explored the link between health outcomes and distance to specialist services. Evidence of 'distance decay' was found by studies assessing tertiary services in Wales,<sup>40</sup> renal replacement therapy<sup>66</sup> and palliative services for cancer.<sup>77</sup> Studies of tuberculosis services<sup>30</sup> and tertiary cardiac services<sup>48</sup> found no evidence of an effect.

***Evidence on the impact of access costs on health outcomes***

Five studies that assessed health outcomes focused on cancer patients. Evidence of increased likelihood of diagnosis at death (i.e. the cancer being diagnosed only after death) in people living further from specialist centres was found in Scotland<sup>37</sup> and England.<sup>60</sup> Both studies adjusted for the effects of deprivation. Evidence of poorer survival rates and later diagnoses were found by a study that used Scottish registry data from the 1990s,<sup>38</sup> but this was not supported by a study of similar data from England.<sup>2 59</sup> However, the English study had limited data on disease stage at diagnosis, whereas the Scottish study used patient case notes to source this information and its findings may therefore be more robust. A study of colorectal cancer that adjusted for age, stage at operation, district of treatment, deprivation and surgery type found that those living furthest from centres of treatment had the worst outcomes. The analysis found that district of treatment was a significant predictor of survival, suggesting that access to specialist cancer centres may be an important influence on health outcomes.<sup>62</sup>

After controlling for deprivation, a study of utilisation of asthma services found a tendency for mortality to rise with increasing distance from hospital, with a relative risk of 1.01 for an increase in distance of one kilometre.<sup>57</sup>

***Evidence on productivity losses***

No study that met the inclusion criteria for the review quantified costs in monetary terms. Travel time was assessed in several studies, but these did not provide monetary valuations for the time travelled.

## Case study of cancer services

- **SCREENING:** most studies find no effect of distance upon utilisation of screening. One study found a small effect after adjusting for deprivation (which is an important explanatory factor for uptake). Mobile screening units do not appear to improve uptake rates relative to hospital-based screening.
- **ACCESS TO HOSPITAL SERVICES:** in deprived areas, surgical utilisation rates by lung cancer patients are lower and this effect is exacerbated by travel time to services. Evidence for an impact of distance on radio- and chemotherapy treatments is mixed. Transport options may influence surgery choice for a minority of breast cancer patients.
- **ACCESS TO CANCER CENTRES/ SPECIALIST HOSPITAL SERVICES:** there is evidence of an inverse relationship between travel time and treatment uptake, which is important because treatment location can influence survival rates. Breast and lung cancer patients who travel further to utilise specialist surgical services may have slightly longer inpatient stays.
- **PALLIATIVE CARE / HOSPICES:** only one study was found, which identified high levels of unmet need that was associated with inequitable provision. As patients are frequently referred directly from residential or nursing homes, distance and travel time are unlikely to be important factors explaining access in this case.
- **OUTCOMES:** the likelihood of 'diagnosis at death' (i.e. cancer undiagnosed during lifetime) was higher in people living further from specialist cancer centres. Findings on the impact of distance on disease stage at diagnosis or on survival were mixed.

The review included 16 studies of the impact of distance upon utilisation of cancer services.<sup>2 31 32 35 37 38 45 47 55 59 60 62 65 72 74 76 77</sup>

Six of the 16 cancer studies investigated the impact of distance on screening uptake.<sup>31 32 35 55 65 74</sup> After adjusting for the effect of deprivation, three studies found that screening uptake was not significantly associated with distance.<sup>31 32 74</sup> One study found a small additional impact of distance on uptake over and above the effect of deprivation, but there was no evidence that mobile screening units improved uptake compared with fixed units (i.e. screening in hospital).<sup>65</sup> A separate study found that mobile units were associated with reduced travel distance, but the impact on uptake was not assessed.<sup>35</sup> A sixth study investigated GP referral decisions for genetic cancer services using semi-structured interviews. Perceived ease of access was reported to be a factor influencing the GP's referral decision, but the study did not solicit patients' views.<sup>55</sup>

Seven studies investigated access to inpatient services.<sup>2 45 47 59 60 62 72 76</sup> In deprived areas, utilisation rates by lung cancer patients are lower for surgical services and this effect is exacerbated by travel time to services.<sup>45 2</sup> There was no evidence of an effect of travel time or distance on likelihood of surgery for colorectal, ovarian or prostate cancer.<sup>2</sup> Evidence on utilisation of treatments such as radiotherapy and chemotherapy were mixed.<sup>2 45 72</sup> One study found tentative evidence that the availability of public transport was a possible contributory factor in determining women's preference for conservation surgery with radiotherapy rather than mastectomy.<sup>72</sup>

Hospital services provided in only a few specialised centres, involving longer than average patient journeys, all showed an inverse association between travel time and treatment uptake.<sup>60</sup> There was some evidence that those who live furthest from specialist centres have the worst outcomes,<sup>37</sup> but the 'geography of survival' was more strongly correlated with location of treatment than with area (deprivation) effects or relative location.<sup>60 62</sup> Patients who travel further to utilise specialist services may have slightly longer inpatient stays for mastectomy, hysterectomy<sup>76</sup> and lung cancer surgery.<sup>47</sup> Only one relevant study addressed palliative care.<sup>77</sup> This study identified high levels of unmet need in the North West of England, associated with inequitable provision of hospice services. As patients are frequently referred to hospices from residential or nursing homes, distance and travel time is unlikely to be an important factor explaining access. The study did not assess community based palliative care services, and so may have overestimated unmet need.

Several studies assessed health outcomes in cancer patients. Separate studies conducted in Scotland<sup>37</sup> and England<sup>60</sup> found evidence of increased likelihood of diagnosis at death (i.e. the cancer being diagnosed only after death) in people living further from specialist centres. Evidence of poorer survival rates and later diagnoses were found by a study that used Scottish registry data from the 1990s,<sup>38</sup> but this was not supported by a study of similar data from England.<sup>2 59</sup> However, the English study had limited data on disease stage at diagnosis, whereas the Scottish study used patient case notes to source this information and its findings may therefore be more robust.

## Conclusions

Recent improvements in study methodology, computational capacity and data availability mean that there is now a growing body of evidence that higher access cost, as proxied by distance or travel time, is negatively related to utilisation for some services. There is strong evidence that access costs significantly lower the rate of utilisation of emergency services, elective care, outpatient attendances, and non-specialist inpatient services. Access cost has little or no effect on uptake of screening and evidence on specialist services is mixed. In terms of health outcomes, access to cancer centres appears to be an important determinant of survival and distance from hospital is associated with an increased likelihood of diagnosis at death.

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## **Appendix 1: search strategies**

### **ACCESS COSTS FOR MEDICAL CARE**

**Anne Mason, CHE**

08/06/2010

Lisa Stirk, CRD

Total number of records found (after deduplication): 549

#### **Searches:**

##### **MEDLINE (Ovid)**

**1950 – May Week 4 2010**

**Date searched: 08/06/2010**

**Records found: 363**

##### **MEDLINE in Process(Ovid)**

**June 07 2010**

**Date searched: 08/06/2010**

**Records found: 18**

1. (patient cost\$ or private cost\$ or time cost\$ or monetary cost\$ or productivity cost\$ or travel cost\$ or transport\$ cost\$ or indirect cost\$).ti,ab.
2. \*"Health Expenditures"/
3. or/1-2
4. distance\$.ti,ab.
5. (long adj2 (journey or travel)).ti,ab.
6. \*"Rural Population"/
7. remote location\$.ti,ab.
8. geographic\$.ti,ab.
9. \*Transportation/
10. \*Travel/ or travel time.ti,ab.
11. \*Time Factors/
12. \*"Catchment Area (Health)"/
13. \*"Health Services Accessibility"/
14. or/4-13
15. 3 and 14
16. ((distance\$ or ((long or time) adj2 (journey\$ or travel\$)) or remote location\$ or geographic\$) adj4 (attend\$ or nonattend\$ or access\$ or uptake\$ or take up or utilis\$ or utiliz\$)).ti,ab.
17. 15 or 16
18. (hospital\$ or inpatient\$ or outpatient\$ or secondary care or clinic or clinics or day case\$ or surgery or screening).ti,ab.
19. 17 and 18
20. exp africa/ or exp asia/
21. 19 not 20
22. limit 21 to english language

##### **EMBASE (Ovid)**

**1980 – 2010 Week 22**

**Date searched: 08/06/2010**

**Records found: 323**

1. (patient cost\$ or private cost\$ or time cost\$ or monetary cost\$ or productivity cost\$ or travel cost\$ or transport\$ cost\$ or indirect cost\$).ti,ab.
2. \*"health care cost"/
3. 1 or 2
4. distance\$.ti,ab.
5. (long adj2 (journey or travel)).ti,ab.

6. \*rural population/
7. remote location\$.ti,ab.
8. geographic\$.ti,ab.
9. \*"traffic and transport"/
10. \*Travel/ or travel time.ti,ab.
11. \*time/
12. or/4-11
13. 3 and 12
14. ((distance\$ or ((long or time) adj2 (journey\$ or travel\$)) or remote location\$ or geographic\$) adj4 (attend\$ or nonattend\$ or access\$ or uptake\$ or take up or utilis\$ or utiliz\$)).ti,ab.
15. 13 or 14
16. (hospital\$ or inpatient\$ or outpatient\$ or secondary care or clinic or clinics or day case\$ or surgery or screening).ti,ab.
17. 15 and 16
18. exp Africa/
19. exp Asia/
20. 18 or 19
21. 17 not 20
22. limit 21 to english language

#### **HMIC (Ovid)**

**January 2010**

**Date searched: 08/06/2010**

**Records found: 57**

(see EconLit)

#### **EconLit (Ovid)**

**1969 – May 2010**

**Date searched: 08/06/2010**

**Records found: 23**

1. (patient cost\$ or private cost\$ or time cost\$ or monetary cost\$ or productivity cost\$ or travel cost\$ or transport\$ cost\$ or indirect cost\$).ti,ab.
2. distance\$.ti,ab.
3. (long adj2 (journey or travel)).ti,ab.
4. remote location\$.ti,ab.
5. geographic\$.ti,ab.
6. travel time.ti,ab.
7. or/2-6
8. 1 and 7
9. ((distance\$ or ((long or time) adj2 (journey\$ or travel\$)) or remote location\$ or geographic\$) adj4 (attend\$ or nonattend\$ or access\$ or uptake\$ or take up or utilis\$ or utiliz\$)).ti,ab.
10. 8 or 9
11. (hospital\$ or inpatient\$ or outpatient\$ or secondary care or clinic or clinics or day case\$ or surgery or screening).ti,ab.
12. 10 and 11

#### **PsycInfo (Ovid)**

**1806 – June Week 1 2010**

**Date searched: 08/06/2010**

**Records found: 91**

1. (patient cost\$ or private cost\$ or time cost\$ or monetary cost\$ or productivity cost\$ or travel cost\$ or transport\$ cost\$ or indirect cost\$).ti,ab.
2. \*Health Care Costs/
3. 1 or 2
4. distance\$.ti,ab.
5. (long adj2 (journey or travel)).ti,ab.
6. \*Rural Environments/
7. remote location\$.ti,ab.

8. geographic\$.ti,ab.
9. \*Transportation/
10. travel time.ti,ab.
11. \*time/
12. or/4-11
13. 3 and 12
14. ((distance\$ or ((long or time) adj2 (journey\$ or travel\$)) or remote location\$ or geographic\$) adj4 (attend\$ or nonattend\$ or access\$ or uptake\$ or take up or utilis\$ or utiliz\$)).ti,ab.
15. 13 or 14
16. (hospital\$ or inpatient\$ or outpatient\$ or secondary care or clinic or clinics or day case\$ or surgery or screening).ti,ab.
17. 15 and 16

### **NHS EED (Cochrane Library)**

**2010 Issue 5**

**Date searched: 08/06/2010**

**Records found: 7**

- #1 ("patient cost\*" or "private cost\*" or "time cost\*" or "monetary cost\*" or "productivity cost\*" or "travel cost\*" or "transport\* cost\*" or "indirect cost\*"):ti,ab
- #2 MeSH descriptor Health Expenditures, this term only
- #3 (#1 OR #2)
- #4 distance\*:ti,ab
- #5 ((long near/2 journey) or (long near/2 travel)):ti,ab
- #6 MeSH descriptor Rural Population, this term only
- #7 "remote location\*":ti,ab
- #8 geographic\*:ti,ab
- #9 MeSH descriptor Transportation, this term only
- #10 MeSH descriptor Travel, this term only
- #11 "travel time":ti,ab
- #12 MeSH descriptor Time Factors, this term only
- #13 MeSH descriptor Catchment Area (Health), this term only
- #14 MeSH descriptor Health Services Accessibility, this term only
- #15 (#4 OR #5 OR #6 OR #7 OR #8 OR #9 OR #10 OR #11 OR #12 OR #13 OR #14)
- #16 (#3 AND #15)
- #17 (distance\* near/4 (attend\* or nonattend\* or access\* or uptake\* or take up or utilis\* or utiliz\*)):ti,ab
- #18 ("long journey\*" near/4 (attend\* or nonattend\* or access\* or uptake\* or take up or utilis\* or utiliz\*)):ti,ab
- #19 ("journey time" near/4 (attend\* or nonattend\* or access\* or uptake\* or take up or utilis\* or utiliz\*)):ti,ab
- #20 ("travel time" near/4 (attend\* or nonattend\* or access\* or uptake\* or take up or utilis\* or utiliz\*)):ti,ab
- #21 ("remote location\*" near/4 (attend\* or nonattend\* or access\* or uptake\* or take up or utilis\* or utiliz\*)):ti,ab
- #22 ("remote location\*" near/4 (attend\* or nonattend\* or access\* or uptake\* or take up or utilis\* or utiliz\*)):ti,ab
- #23 (#17 OR #18 OR #19 OR #20 OR #21 OR #22)
- #24 (#16 OR #23)
- #25 (hospital\* or inpatient\* or outpatient\* or secondary care or clinic or clinics or day case\* or surgery or screening):ti,ab
- #26 (#24 AND #25)

### **Index to Theses (LS search)**

<http://www.theses.com/>

**Searched 08/06/10. Last updated 13 May 2010**

**Records found: 29** (sent as Word file 'index to theses.doc')

distance\* or time\* or journey\* or travel\* or location\* or geographic\*  
AND

hospital\* or inpatient\* or outpatient\* or "secondary care" or clinic or clinics or day case\* or surgery or screening

**Index to Theses (AM search)**

<http://www.theses.com/>

**Searched 07/06/10.**

**Records found: 23**

distance AND (uptake OR utilisation OR access) AND (hospital OR health)

**Google scholar (AM search)**

<http://scholar.google.co.uk/>

**Searched 08/06/10**

**Screened first 12 pages. Records found: 23**

(distance OR travel OR journey) AND (hospital OR inpatient OR outpatient OR clinic OR clinics OR "secondary care" OR day case) AND (access OR utilisation OR utilization OR uptake OR take up) AND (England OR Scotland OR Wales OR northern Ireland OR UK)

## Appendix 2: included studies

Appendix Table 1: UK studies addressing the impact of distance/access costs on utilisation (N=48)

Study	Clinical area	Study type Year (data collection)	Country Setting N	Findings	Comment
Abubakar, 2008 <sup>30</sup>	Tuberculosis	Multivariate regression 2001-2003	England & Wales Urban vs. rural locations 16,100	Majority of cases (97%) lived in urban areas. Rural / urban location was not found to be an independent determinant of treatment completion. Gender, ethnicity and age were the main explanatory factors for treatment completion.	
Ahmad, 2002 <sup>31</sup>	Breast cancer: screening	Multivariate regression 1994-7	England (London) Community N: not reported	Travel time had no significant impact on uptake of screening in inner city areas, even in deprived wards. Deprivation was related to uptake.	Few confounding factors taken into account.
Bentham, 1995 <sup>32</sup>	Cervical cytology screening	Regression analysis using GIS, adjusted for GP practice characteristics, remoteness, deprivation. Study linked post-coded FHSA patient records with census data and with information on the uptake of cervical cytology screening. 1988/89	England (Norfolk) County (Norfolk) N: 72 GP practices	Under the new population based programme, non-response was not significantly associated with rural remoteness. There was a significant relationship between remoteness and uptake of screening under the previous opportunistic programme.	
Bethell, 2008 <sup>33</sup>	Cardiac Rehabilitation	Questionnaire survey of rehabilitation centre co-ordinators; analysis of HES data 2003/4	England Outpatient rehabilitation N=127	Of eligible patients, uptake rates were generally low and varied between regions.	Access cost not formally assessed to explain uptake variations.
Bond, 2000 <sup>34</sup>	Cardiology, ENT, general medicine, general surgery, gynaecology and rheumatology	Quasi-experimental with matched controls (outpatient clinics) Year not stated	England Outreach clinics held in primary care settings (14 counties) N=38 clinics	The outreach clinics had lower non-attendance rates than outpatient clinics: 10% (98):16% (117) (p<0.0001). Although access improved, the impact of outreach on health outcomes was small. The NHS costs of outreach were significantly higher than outpatients.	Results not reported separately by speciality.
Bond, 2009 <sup>35</sup>	Breast screening	Modelling study, exploring impact of mobile units on carbon emissions and distance travelled 2004/6	England (Norfolk) Mobile breast screening units (N=20) vs. hospital based screening (N=2) N=61,000 women	Mobile units result in a return journey distance savings of 1.4m km for this population.	Does not directly assess impact of distance on utilisation or health outcomes.
Campbell, 1994 <sup>36</sup>	accident and emergency departments	8 week prospective cohort study: computerized hospital records, patient surveys, data collected by practices 1993	Scotland (West Lothian) 19 GP practices and 1 A&E department (AED)	Distance between practice and hospital is as an important predictor of a practice's self-referral rate to AEDs, but not of the GP referral rate.	West Lothian is semi-rural area with above average deprivation scores.
Campbell, 2000 <sup>37</sup>	Cancer	Follow up cohort study of 64,000 patients listed on the Scottish cancer registry. 1991-1995	Scotland Community; cancer centres N=64,000	Increasing distance from a cancer centre was associated with lower probability of diagnosis before death for stomach, breast and colorectal cancers and poorer survival after diagnosis for prostate and lung cancers.	Outcomes Analysis adjusted for adjusted for age, sex, deprivation, distance to cancer centre and settlement size

Study	Clinical area	Study type Year (data collection)	Country Setting N	Findings	Comment
Campbell, 2001 <sup>38</sup>	Cancer (lung / colorectal)	Review of random sample of case notes of patients diagnosed with lung or colorectal cancer. 1995 / 1996	Scotland – N/NE Community; cancer centres N=1323	For both cancers combined, adjusted odds ratio for disseminated disease at diagnosis in furthest group (>57km) compared to the closest group (<6km) was 1.59 (P = 0.037). Patients who live remote from cities and the associated cancer centres have poorer chances of survival from lung or colorectal cancer because of more advanced disease at diagnosis.	Outcomes Adjusted odds ratio: after adjusting model for confounding factors (settlement size, deprivation, health board of residence, sex, age, smoking status and cancer site).
Carr Hill, 1994 <sup>39</sup>	Any	Multi-level modelling (two-stage least squares regression) undertaken to inform needs-based allocation formula. 1990/1	England Country, with small geographical areas ("synthetic wards", population=10,000) as unit of analysis N: ~50m	Utilisation of acute hospital beds not found to be significantly related to access (distance). For non-acute beds (e.g. psychiatric beds), the finding was counter intuitive: more accessible acute services were associated with lower rates of utilisation (negative relationship).	Analysis adjusted for need and a wide range of potential confounders (including deprivation). Limitations: authors note the lack of time-series data and inadequacy of measures of supply and utilisation.
Christie, 2003 <sup>40</sup>	Tertiary care	Modelling study, exploring hypothetical scenarios of change in configuration of NHS tertiary hospital service provision in Wales: travel time analysis. 2001	Wales Tertiary hospital services N: all residents registered with a GP Subgroups: residents aged 75+; residents in the most deprived 10% Census districts; residents of rural areas	Centralization of services reduces geographical access for all population subgroups. Access varies between population subgroups, both between and within different scenarios of service configuration. A change in service configuration may improve access for one (demographic) subgroup but reduce access for another.	
Congdon, 2001 <sup>41</sup>	Emergency services	Case modelling study (alternative models tested for modelling of patient flows to A&E in terms of patient demand, supply of acute beds and indices of accessibility and proximity). Model adjusted for deprivation using socio-economic indices (unemployment, single pensioner households, and single carer households). 1997/8	England (NE London / Essex) Emergency services 127 electoral wards in 6 local authorities and eight sites with A&E facilities	The Extended distance model with demand and access variation fitted the data better (predicted expected from actual utilisation for 1997/8). Time-series extensions to the model recommended.	Methodological paper on alternative modelling approaches, with case study Context: to inform plans for emergency services re-configuration in N. London / Essex in 2003/4
Congdon, 2006 <sup>42</sup>	Emergency admissions	Regression analysis of observational data to explore variations in hospital utilisation across small areas. Model adjusted for deprivation using IMD. 2003	England (N. London) 149 small areas 53 GP practices	Evidence of variation in utilisation (attendance and admission rates) across areas and practices after controlling for need. Remaining differences between practices may be attributable to referral behaviour unrelated to need, or to staffing, resourcing, and access issues.	

Study	Clinical area	Study type Year (data collection)	Country Setting N	Findings	Comment
Cook, 2009 <sup>43</sup>	Human Immunodeficiency Virus (HIV)	Regression modelling study. Model adjusted for deprivation using IMD. 2005/6	England (NW) HIV care N=3983	Distance travelled, and type of HIV services used, were associated with socioeconomic status, even after accounting for ethnicity, route of infection and age. Thus despite offering an 'equitable' service, travel costs may advantage those with higher income.	
Cordiner, 2010 <sup>44</sup>	Community Paediatrics	Retrospective cohort study of outpatient follow-up arrangements and non-attendance of children on Special Needs Register Year: NS	Scotland Paediatric outpatient clinics N=18	With an increase in the number of appointments made and the distances involved in attending these, the number of missed appointments tends to increase.	
Crawford, 2009 <sup>45</sup>	Lung cancer	Analysis of cancer registry data 1994 to 2002 (year of diagnosis)	England (north) Hospital care N=34,923	Living in a deprived locality reduces the likelihood of undergoing diagnostic/ surgical/ active treatment services for lung cancer with the exception of chemotherapy for small cell lung cancer. This is amplified by travel time to services.	
Dusheiko, 2009 <sup>46</sup>	Any outpatients (attender and non-attenders).	Log-log generalised linear model for binary responses (to fit rare event data). Dependent variable: probability of non-attendance (DNA). Covariates: individual characteristics; hospital dummies; SHA dummies. Interaction effects also assessed. 2005/6	England Country, with Lower Super Output Area of residence (LSOA) 10% random sample of first outpatient appointments in HES: N=790,000	The probability of non-attendance was 11.6%. Distance had a significant positive effect on probability of non-attendance. An increase in straight line distance of 10km typically increased the probability of non-attendance by 7%. Assessments using road distance or travel time produced effects of a similar magnitude. The elasticity of DNA probability wrt straight line distance was small (5%). As distance increased, DNA probability increased but at a decreasing rate. In areas with higher levels of income deprivation, the positive effect of distance on utilisation was increased but by a small amount.	Limitations highlighted by the authors: Unable to use patient postcodes, so distance proxied by LSOA. Non-attenders included cancellations; no shows; and late arrivals who could not be seen. Distance may affect these groups differently. Analysis could not adjust for disease severity within specialty groups (diagnostic data are poorly coded in the outpatient HES). However, this was partially captured by patient waiting times and priority referrals.
Fleming, 2008 <sup>47</sup>	Lung cancer	Multivariate regression analysis of case notes from the Northern Ireland Cancer Registry to explore costs, cancer staging at diagnosis, and patient characteristics (age, co-morbidity, deprivation and distance to treatment centre) 2001 (date diagnosis)	N. Ireland Community: cancer centres N=724	The greater the distance from the cancer centre to the patient's residence, the longer the inpatient stay ( $p < 0.05$ ). Distance to the hospital of first presentation or hospital of diagnosis had no effect on duration of inpatient stay.	Explores cost drivers, including distance



Study	Clinical area	Study type Year (data collection)	Country Setting N	Findings	Comment
Gatrell, 2002 <sup>48</sup>	tertiary cardiac services	Multivariate regression analysis of rates of investigation (angiography) and surgery (bypass grafts and angioplasty). 1993-1996	England (NW) Tertiary care N: 2 districts relatively distant from the main tertiary centre	Utilisation by electoral ward is related to material deprivation, after adjusting for travel time and need. Distance (as measured by travel time) from tertiary centre had relatively little impact on chance of intervention.	Earlier study of all districts in NW found that greater distance associated with lower rates of investigation and surgery.
Gilthorpe, 2003 <sup>49</sup>	Any Utilisation assessed using: standardised episode rates admission rates bed rates	Multilevel multivariate models to compare 3 ward-level healthcare utilisation measures relative to the Townsend index of material deprivation, its components, and four rural/urban characteristics. Hospital Episode Statistics (1994/5-1998/9) socio-demographic census data (1991)	England (W. Midlands) Hospital services 1 Region (20 Health Authorities, 826 wards. 5.3m population)	When deprivation is assessed using the composite Townsend measure, rurality has little additional impact on healthcare utilisation. However, when deprivation is assessed using components of the composite measure, a significant effect is sometimes evident (depending on how rurality is measured).	W. Midlands has a diverse rural/urban population, so suitable for this study.
Hambridge, 1992 <sup>50</sup>	Clinical forensic psychology	Methods not reported 1986-1989	England Outpatient referrals to a Regional Secure Unit N=270	Geographical proximity was not a significant predictor of attendance.	
Harrison, 2005 <sup>51</sup>	Cardiac rehabilitation services	Logistic regression of questionnaire survey data from patients eligible for cardiac rehabilitation. Model adjusted for deprivation using IMD. 2000-2001	England (Midlands) Cardiac outpatient rehabilitation services N=263	The major reported barrier to utilization of services was access problems (public transport, parking, time / location of classes). However, no geographical factors were associated with uptake of services, although the possible effect may have been mediated by the relative affluence of the locality.	
Haynes, 1999 <sup>52</sup>	Acute, psychiatric and geriatric care	Regression analysis, adjusting for need (including deprivation). First episodes only. 1991-1993	England (E Anglia) Inpatient care N=520,000 inpatient episodes	Controlling for needs and provision, distance to hospital was negatively related to the rate of acute, psychiatric and geriatric episodes. The largest effect was for psychiatric episodes.	
Heenan, 2006 <sup>53</sup>	Any (health/ social care need)	Interviews with members of farming communities aged >=60. Data analysed using thematic analysis. Date: unclear	N Ireland (County Down) Health and social care N=45	Having private transport considered crucial for access to health and social care, because public transport was so limited. Anecdotal evidence that rurality decreased utilisation.	
Hull, 1997 <sup>54</sup>	Emergency services	Regression analysis of routine data 1994	England (London) A&D departments N=4	Utilisation strongly correlated with deprivation assessed by owner-occupancy. Distance to the nearest accident and emergency department correlated negatively with attendance ( $R = -0.27$ , $P = 0.006$ ).	
Iredale, 2005 <sup>55</sup>	Specialist services (cancer genetic services)	Semi-structured interviews with healthcare professionals based in GP practices.	Wales (Montgomeryshire) Specialist diagnostic hospital services N=19	Rurality influences referral behaviour as distance, time travelling and accessibility by car and public transport are all perceived to have an impact on the patient's decision to attend a clinic appointment. Some patients are being referred	Study area has little public transport

Study	Clinical area	Study type Year (data collection)	Country Setting N	Findings	Comment
				outside Wales as ease of access to services is considered more important than distance.	
Jessop, 1988 <sup>56</sup>	Surgery: elective procedures	Analysis of age-sex standardised hospital admission rates. 1979-83	England (Essex) Hospital care N: unclear	Proximity was not found to be the dominant factor in determining access as measured by standardised discharge ratios	Data quality poor, model did not adjust for hospital level factors; findings may not be robust.
Jones, 1997 <sup>57</sup>	Asthma	Regression analysis 1988-92	England and Wales Inpatient care N= 401 local authority districts	After controlling for deprivation, there was a tendency for mortality to rise with increasing distance from hospital, with a relative risk of 1.01 for an increase in distance of one kilometre (95% CI 1.00 to 1.02).	
Jones, 1998 <sup>58</sup>	Asthma	Logistic regression analysis of questionnaire data, adjusted using electoral ward 1991 census data for deprivation (%households where the head is in social class 4 or 5 (low socio-economic status), % without access to a car, % renting from a local authority). 1992-3	England (Norfolk) Primary and secondary care N= 9764 adults aged 20 - 44	Those living further from an acute hospital unit were less likely to have consulted a hospital doctor in the previous 12 months.	
Jones, 2008 <sup>59</sup>	Cancer (breast, colon, rectal, lung, ovary and prostate)	Logistic regression analysis of cancer registry data using GIS. Model adjusted for deprivation using IMD. 1994-2002	England (N. Yorkshire) Secondary and specialist care (radiotherapy) N= 117,097	Lung cancer patients living further from a thoracic surgery hospital were less likely to receive surgery, but there was no association between distance and likelihood of surgery for other cancers. Lung cancer and rectal cancer patients were less likely to receive chemotherapy if they lived distant from these services. Services provided in only a few specialised centres, involving longer than average patient journeys, all showed an inverse association between travel time and treatment take-up.  However, travel times to hospital and other accessibility measures showed no consistent associations with stage at diagnosis or survival.	Study adjusted for patient characteristics and site characteristics. Data on tumour stage available only for a small number of sites. Survival was found to be correlated with distance to general practice.
Jones, 2010 <sup>60</sup>	Cancer: breast, colorectal, lung, ovarian or prostate cancer	Logistic regression analysis of data from Northern and Yorkshire Cancer Registry; travel time to general practitioner and hospital services by GIS; social deprivation assessed using IMD scores. Study group: patients with post-mortem diagnosis of cancer (i.e. not previously diagnosed).	England (North) Primary, secondary and tertiary care N= ~121,000	There was no association between the odds diagnosis at death and access to primary care. For all sites except breast, the highest odds of being a cancer diagnosed at death fell among those living in the highest quartile of hospital travel time, although it was only statistically significant for colorectal and ovary tumours. Those in the most deprived and furthest travel time to hospital quartile were 2.6 times more likely	Study could not adjust for waiting times, patient co-morbidity or tumour grade.

Study	Clinical area	Study type Year (data collection)	Country Setting N	Findings	Comment
		1994 and 2002		to be a diagnosis at death case compared with those in the most affluent and proximal areas. Study provides some evidence that poorer geographical access to tertiary care, in particular when coupled with social deprivation, may be associated with increased odds of diagnosis at death.	
Jordan, 2004 <sup>61</sup>	Any	Regression analysis of effect of distance on access. Remoteness defined as a ward >25km from nearest hospital. Outcomes assessed using standardised mortality ratios and rates of LLTI (Limiting Long Term Illness) 1992-7	England (SW) – former SW region Primary and secondary care N=1469 GP practices N=39 hospitals Population: 6m	Although geographical access to health services was generally good, remoteness from health services affected both urban and rural areas. In areas furthest from hospitals there was some evidence of higher rates of LLTI and of deprivation in the most remote wards, indicating higher need for services in the areas furthest from them.	
Kim, 2000 <sup>62</sup>	Colorectal cancer	Survival analysis to explore geographical variation in survival 1991-1995	England (Wessex) N= 5147	Age, stage at operation, district of treatment and surgery type are by far the most important predictors of survival from colorectal cancer. District of treatment, distance and deprivation all show a relationship to outcome using survival curves, but when adjusting for other covariates using the Cox model, and considering deaths from all causes, only district of treatment was a very significant covariate ( $p < 0.0001$ ). There is some evidence that those who live furthest from centres of treatment have the worst outcomes but the 'geography of survival' manifests itself more through where patients are treated than through area (deprivation) effects or relative location.	Study adjusted for disease stage at time of surgery. Location effect persists.
King, 2009 <sup>63</sup>	Any	Qualitative study: interviews, focus groups with people aged $\geq 55$ Two remote communities selected for study (both within 70 miles of nearest hospital & with 25-30% population aged $> 65$ ) 2005/6	Scotland (Highlands) Primary, community and acute hospital services N=23 (interviews) N=4 (focus groups)	Residents accepted that their choice of location brought with it a responsibility for accessing hospital services – e.g. need to drive there rather than call an ambulance. There was also a strong social network, with neighbours willing to help those without a car.	Part of the EU funded Northern Periphery Programme (Our Life As Elderly).
Lindsay, 2006 <sup>64</sup>	Screening for aortic aneurysm	Prospective cohort study 2002/3	Scotland (Highlands / Western Isles) Preventative care undertaken in GP practices, community and urban hospitals N=8292	Non-attendees were more deprived in terms of income, employment, education and health but geographical location of residence of those invited did not affect attendance.	

Study	Clinical area	Study type Year (data collection)	Country Setting N	Findings	Comment
Maheswaran, 2006 <sup>65</sup>	Breast screening	Regression analysis 1998-2001	England (N. Derbyshire) Mobile and fixed screening units N=83,000	Uptake of breast screening decreased with increasing socio-economic deprivation. There was a small decrease with increasing distance, no difference between fixed and mobile units, and no difference between urban and rural areas.	
Martin, 1998 <sup>66</sup>	Renal replacement therapy (RRT)	Multilevel modelling (individual; provider; health authority) to assess effects of age, sex, ethnicity, deprivation, access and supply factors on acceptance onto RRT 1991-92	England Secondary care N=53 renal units	In all regions, greater distance from a renal unit was associated with a lower likelihood of acceptance into RRT. Distance was found to be important after a particular threshold (26 minutes) is reached but travel times were a more useful measure than crow-fly distances. Deprivation, access and supply characteristics significantly influence acceptance rates but that there are also important regional influences.	
Morris, 2003 <sup>67</sup>	Any	Multilevel modelling of panel data from Health Survey for England. Model adjusted for deprivation using IMD. 1998-2000	England Primary care; secondary care (inpatient, outpatient, day case) N=51,000	After controlling for need variables such as age, sex, health and for the supply of health care, utilisation was linked to income, ethnicity, economic status and education. Low-income individuals and ethnic minorities had lower use of secondary care despite having higher use of primary care. Hospital distance had a significant and negative effect on the probability of an inpatient stay.	Aim is to explore existence of horizontal inequity (differential utilisation by persons with the same health needs).
Mullen, 1998 <sup>68</sup>	Specialist services	Focus groups / questionnaires / interviews 1996/7	England (Oxford / Birmingham) Hospital services N: unclear (focus groups) N=119 (questionnaires) N=6 (outpatient interviews)	The main concern of study participants was ease of access rather than distance: longer easier journeys were preferred to shorter difficult journeys. "some would travel to a more distant hospital if parking was easier"	Questionnaire design may have been flawed.
Parkin, 1980 <sup>69</sup>	Minor trauma	OLS regression analysis of survey and interview data, originally undertaken to explore choice of care location for minor accidents. Analysis undertaken at ward level and adjusted for social class using 1971 Census data. 1971	England Primary (GP surgery) and secondary care (A&E department) Survey sizes: N=3 (hospitals A&E) N=NS (GP practices with hospital catchment areas) N=346 (patients)	When analysed at the level of the electoral ward, greater distance from hospital was associated with higher levels of utilisation. "The only conclusion from this analysis is that it may be dangerous to relate fairly small survey data collected for one purpose to large scale population figures for other purposes" (p 104)	PhD thesis using existing survey data to address the question of distance effects upon utilisation. Inadequacies in the data, study design and measures of distance mean findings should be treated with caution.
Propper, 2007 <sup>70</sup>	Elective, emergency and maternity	Regression analysis of distances travelled for different types of	England Secondary care	Individuals residing in wards with higher deprivation travel less far for all types of	Analysis predated introduction of patient choice.

Study	Clinical area	Study type Year (data collection)	Country Setting N	Findings	Comment
	admissions.	admission. 2003-4	N: not reported (all admissions for 2003/4)	admission. This finding held for both rural and urban wards, with more deprived patients making fewer longer journeys for elective treatment.	
Ryan, 2000 <sup>71</sup>	Elective care	Discrete choice conjoint analysis to elicit willingness to trade access cost and waiting time. Analysis adjusted for employment status and car ownership. Date: NS	England (Isle of Wight) Elective inpatient care N=556	Respondents with their own transport were significantly more likely to be willing to travel to the mainland to reduce waiting time. Respondents willing to pay £12 for reduction in waiting time of 1 month.	Assesses hypothetical responses to choices; actual behaviour may differ.
Sauerzapf, 2008 <sup>72</sup>	Breast cancer (early): radiotherapy following breast conservation surgery (BCS)	Logistic regression analysis of cancer registry data (dependent variable: choice of BCS vs. mastectomy) 1994-2002	England (North Yorkshire) N=6014	Adjusting for the effects of age, deprivation and hospital type, the choice of BCS was not associated with the estimated car journey time to radiotherapy for most women but there was an association for patients living in places without a regular bus service, so transport problems might influence surgery choice for a minority of women.	Around 10% of women had a journey time >60 minutes.
Slack, 1997 <sup>73</sup>	Any	Linear regression to explore impact of access factors and deprivation on hospitalisation rates 1998/9	England (Trent Health Authority) Hospital admissions rate at ward level N=169 electoral wards	Deprivation and accessibility to services were both significant factors determining hospitalization rates at electoral ward level.	
Sutton, 1994 <sup>74</sup>	Breast screening	Interviews, questionnaire survey, attendance data; control group (no interview / survey) used to assess impact of study participation (Hawthorne effect). Multivariate regression analysis of study data, adjusting for social class and education. 1990	England (London) Outpatient N=3291	Distance was not associated with likelihood to attend / not attend. Social class and education were not predictive of attendance.	
White, 2006 <sup>75</sup>	Renal impairment: renal replacement therapy	Modelling study exploring impact of new renal dialysis service on utilisation, adjusting for distance and deprivation. 2004	Wales Outpatient N: population based study (2713 in dialysis)	Prevalence of HD fell significantly with increasing travel time from units. This was not influenced by the Welsh deprivation index. Prior to the opening of a new HD unit in Aberystwyth, prevalence in the surrounding area was significantly lower than for Wales as whole, but within 2 years, prevalence had risen to approximate national levels. In Haverfordwest, an area >30 min drive from any current facility, prevalence is consistently and significantly lower than for Wales as a whole, and has not shown the growth seen elsewhere in the country.	

Study	Clinical area	Study type Year (data collection)	Country Setting N	Findings	Comment
Wood, 1984 <sup>76</sup>	Mastectomy, hernia repair, appendectomy, prostatectomy, hysterectomy, vein operations	Regression analysis of impact of distance on length of stay and hospital utilisation for certain procedures. Deprivation proxied as proportion of patients in socio-economic groups 1 / 2. 1971/2 1975/7 1978	Scotland (N/E: Grampian) Inpatient use: incidence (discharge rates) and intensity (length of stay). 440,000 approx (population)	Distance was not significantly related to discharge rates (incidence of utilisation). Distance was associated with increased length of stay (intensity of utilisation) for mastectomies and hysterectomies.	Few confounding factors taken into account (e.g. co-morbidities and severity not assessed)
Wood, 2004 <sup>77</sup>	Cancer, palliative care	Geographical Information Systems (GIS) used to assess access by electoral ward. Adjusted for deprivation using Townsend score (poverty/ material wealth). 2002	England (North West) (5 counties, >1000 wards) Inpatient hospices N=27 hospices with 380 beds (range: 4 to 36)	After adjusting for deprivation, there is an estimated 3,500 individuals with unmet need for inpatient hospice care due to access problems.	Study did not account for community / outpatient provision of palliative care services. Hospice patients may be referred directly from nursing homes or as emergency admissions from home, so drive time may not be relevant.

## Appendix 3: excluded studies

**Appendix Table 2: Excluded studies with reasons for exclusion**

Study	Reason for exclusion
Aspin, 2007 <sup>10</sup>	Does not address impact of access cost on utilisation.
Bikker, 1992 <sup>11</sup>	Non UK: Netherlands.
Bryan, 1995 <sup>12</sup>	Does not address impact of access cost on utilisation.
Burton, 2006 <sup>13</sup>	Does not address impact of access cost on utilisation.
Fone, 2006 <sup>14</sup>	Assessment of perceived and actual accessibility. No exploration of utilisation.
Frew, 1999 <sup>15</sup>	Does not address impact of access cost on utilisation.
Gatrell, 1998 <sup>16</sup>	Does not address effects of distance or travel costs
Griffiths, 2001 <sup>17</sup>	Does not address impact of access cost on utilisation.
Haynes, 2006 <sup>18</sup>	Does not address impact of access cost on utilisation.
Hazelgrove, 2000 <sup>19</sup>	Does not address impact of access cost on utilisation.
Hyndman, 2000 <sup>20</sup>	Non UK: Australia
Jack, 2003 <sup>21</sup>	Observed geographical variations in uptake but did not formally explore relationship between access and utilisation.
Maheswaran, 1997 <sup>22</sup>	Addresses impact of geographical variations in supply rather than demand.
Manson-Siddle, 1998 <sup>23</sup>	Addresses impact of geographical variations in supply rather than demand.
Oliveira, 2006 <sup>24</sup>	Non UK: Portugal
Parkin, 1987 <sup>1</sup>	Does not address impact of access cost on utilisation.
Sculpher, 1993 <sup>25</sup>	Does not address impact of access cost on utilisation.
Seymour, 2006 <sup>26</sup>	Focus is on supply side issues.
Whetten, 2006 <sup>27</sup>	Non-UK: US
Woods, 1988 <sup>28</sup>	Does not address impact of access cost on utilisation.
Woolley, 2007 <sup>29</sup>	Does not address impact of access cost on utilisation.

## Appendix 4: methodological issues and developments

Overall, the evidence sheds some light but raises many unanswered questions:

“Our understanding of the effect of distance on the use of services and on health outcomes is far from complete. Both the measurement of access and the understanding of need and deprivation require further exploration.”<sup>61</sup>

During the review, several methodological issues emerged as important considerations influencing the robustness of the analytic approach and the reliability of study findings, which are summarised here.

### Study design and selection of variables

Analyses typically model utilisation as a function of healthcare need and supply. However, supply and utilisation may be jointly determined – in other words, the variables are endogenous, with supply determined by (past, current or expected) utilisation and healthcare need.<sup>39</sup> If models do not test and adjust for endogeneity, estimates may be biased.

A review in 1997 found that most studies were cross-sectional and poorly adjusted for the effects of confounding.<sup>3</sup> As the relationship between distance and utilisation is complex, studies that fail to adjust for relevant confounding factors can be misleading. For example, the summary statistics from a recent analysis of outpatient non-attendance show that non-attenders travelled on average shorter distances than attenders. However, when differences in individuals’ demographic and clinical characteristics are taken into account along with hospital and health authority factors, a significant positive relationship between distance and the probability of non-attendance emerges.<sup>46</sup> Studies that detect no overall effect may mask significant effects within particular subgroups (clinical or socio-economic).<sup>3</sup> Equally, whether effects are ‘significant’ may reflect the types of measure selected to assess deprivation or rurality.<sup>49</sup>

Different options are available for predictive modelling that seeks to explore the access and utilisation implications of service reconfiguration.<sup>41</sup>

### Measures of need

The concept of need is complex, studies are heterogeneous regarding the way they define need (choice of variables, e.g. health status) and the way that they measure need (e.g. self-reported health, long-term illness for individuals; mortality ratios for areas). However, if we want an unbiased estimate of the impact of access costs on utilisation, then analyses must adjust appropriately for underlying need. One study highlights the inherent subjectivity of this decision:

“A wide range of factors influences individual use of health services. To test for and to measure the extent of inequity requires value judgements to distinguish between need variables which ought to affect use and non-need variables which ought not. There is horizontal equity when individuals with the same needs consume the same amount of health care. If use varies with non-need variables there is horizontal inequity. There is vertical equity when individuals with different levels of need consume appropriately different amounts of health care.”<sup>67</sup>

### Measures of deprivation

Deprivation measures differ in the aspects of disadvantage they assess. The Jarman, Townsend and Carstairs scores combine different measures from the Census survey. The Jarman Underprivileged Area score was designed to measure the need for primary care, whereas Townsend and Carstairs assess material wealth or poverty.<sup>77</sup>

One study that assessed deprivation using a range of different components from the Townsend Index found that the significance of the effects depended on the types of measure selected to assess deprivation.<sup>49</sup> This suggests that it may not be deprivation in general that impacts uptake, but that particular types of deprivation (such as car ownership) determine access and are therefore more sensitive indicators for this research question.

The Indices of Multiple Deprivation, introduced in 2000 in England, may more accurately reflect need for health care than traditional census-based indices. The IMD contain a measure of geographical



access to services, which has been of particular interest to rural populations and may provide a missing dimension to the measurement of deprivation. Deprivation indices assign a numerical weighting to small areas, such as electoral wards.<sup>77</sup> IMD scores are routinely collected as part of the Hospital Episode Statistics.

### **Geographical measures of access**

Distance and/or travel time are commonly used to proxy access. The accuracy of measuring geographical position has improved over the last decade, with the advent of Geographical Information Systems (GIS) and Global Positioning Systems (GPS).<sup>6</sup> However, for studies that aim to model geographical separation in a way that correlates well with the perception of local residents, there may be minimal advantage in using sophisticated measures.<sup>14</sup> A study of cancer patients' travel time suggested that GIS estimates had little advantage over straight line distance estimates, but were superior to estimates from individual patient reports because they were not influenced by temporal effects such as road works or congestion. Better measures of geographical access, which integrate public and private transport availability with distance and travel time, may be a way forward.<sup>61</sup> However, other studies conclude that straight line distances are unrealistic because they fail to account for barriers to movement.<sup>66 77</sup> As attendance often necessitated long average journey distance, crow-fly distances underestimated the effects of physical barriers such as major rivers or hills, and of intra-urban congestion.<sup>66</sup> Travel time is a more realistic measure, but assumes that patients own a private car and that speed is constant on different types of road.<sup>77</sup>

Even if geographical access to health services is generally good, remoteness from health services can affect both urban and rural areas. Studies concentrating purely on rural areas are therefore likely to underestimate the extent of geographical barriers to accessing health care.<sup>61</sup> A study of the south west of England (population: 6m) found that almost a quarter of households in the decile of wards most remote from hospital services had no car in 1991. For these individuals, travel is likely to be more difficult than implied by current measures of geographical access.

The 'Edge Effect' occurs when the study area is defined by a border that does not prevent travel across the border. An example of the edge effect is when GPs consider ease of access more important than proximity when making referrals, even if it means the patient travelling across the border.<sup>55</sup>